

THE SCOTTISH GEOGRAPHICAL MAGAZINE



Volume 71, No. 1

April 1955

GEOGRAPHY—A DISCIPLINE IN DISTANCE		
J. W. WATSON	Illustrated	1
THE WEATHER OF 1954		
H. H. LAMB	Illustrated	14
THE WEATHER OF 1954 AND THE SCOTTISH FARMER		
A. R. WANNOP		22
CHANGES IN POPULATION DISTRIBUTION IN THE COUNTY OF FIFE		
JOHN C. DEWESLEY	Illustrated	27
URBAN GRADES AND SPHERES OF INFLUENCE IN SOUTH WEST WALES		
HAROLD CARTER	Illustrated	42
NOTES :		
FOOD FROM AFRICA		43
WANLOCKHEAD—THE HIGHEST VILLAGE IN SCOTLAND		59
POWER FROM GEYSERS IN NEW ZEALAND		59
REVIEWS OF BOOKS		60
ROYAL SCOTTISH GEOGRAPHICAL SOCIETY :		
PROCEEDINGS		64
LECTURE SESSION 1954-55		64
CONTRIBUTORS, S.G.M. VOL. 71, No. 1 APRIL 1955		64

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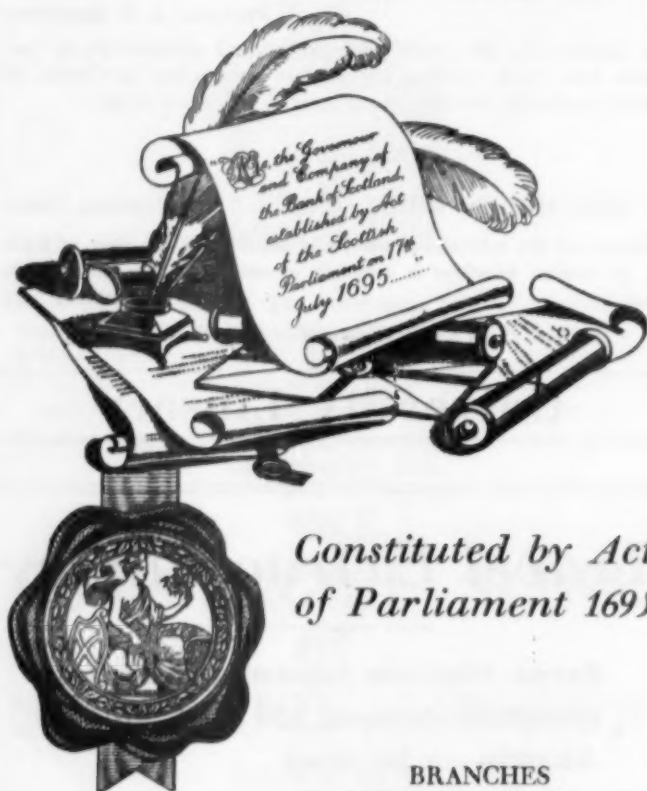
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THE SCOTTISH GEOGRAPHICAL MAGAZINE

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GEOGRAPHY—A DISCIPLINE IN DISTANCE

J. W. WATSON

Inaugural Lecture delivered in the Faculty of Arts, Edinburgh University, October 1954.

It is with great pleasure that I renew my association with Edinburgh and with Edinburgh University. I count it a particular honour to have succeeded one as honoured among his peers as the late Professor Ogilvie. Both the university and the city lost one of its outstanding figures with his untimely death. I may say that wherever I went in the New World, from universities as far apart as Edmonton and São Paulo, I heard nothing but the finest of tributes to my predecessor, both as a geographer and as a man. I think what most people admired him for was his breadth and sanity of view. In a period when the discipline of geography needed steady counsel, his wise and balanced outlook was a great contribution.

Professor Ogilvie was the first occupant of the Chair of Geography at Edinburgh University. This at once reminds us how new the subject is in the curriculum. It is true he followed the distinguished and scholarly Dr Chisholm, who introduced the subject to the university, but even at that, the teaching of geography spans little more than two life-times.

While this cannot give us the cherished privileges of age, it presents us with the happy opportunities of youth, and allows us to enquire, with pardonable freshness, into the reaches of our subject. For geography is always being drawn into new distances, to discover new lands and seas—not only those made by nature, but those that form or perish within the mind of man.

THE IMPORTANCE OF DISTANCE

Distance, as a measurable phenomenon, is basic to the study of geography. When a geographer observes a fact and locates it as part of the earth's scene, he expresses that location as a distance from the prime meridian and the equator. If his observations record other

locations, as they probably will, (most phenomena occurring in groups), he will trace out a distribution having breadth, length and depth. His distribution map, then, becomes a measure of the distances reached by objects in their attempt to make or keep a place for themselves on the globe. May this not be the important thing about measuring distance? For the distances reached are an indication of the extent to which objects have adapted themselves to, or dominated, their environment. To me, this has always been a most stimulating fact about geography: its emphasis on distance is an emphasis on *extent*. It provides a record of the extent to which forces, whether inanimate or animate, have shaped the earth and, in doing so, have shaped themselves.

I feel that the idea of geographical extent should be particularly linked with historical period; in fact, that the basis of temporal periodicity could be, and perhaps should be, spatial extent. The connection is a fruitful one, wherever it has been tested. In historical geology, for example, many periods are defined by the maximum extent reached by a certain formation. In glaciography we are all familiar with the terms Günz, Mindel, Riss and Würm which describe the maximum extent of the four chief phases of Quaternary ice in Europe. To measure periods by extent has proved universally acceptable in this case.

If with ice, why not with other factors; with even immaterial factors, such as religion? Not a few geographers, notably Griffith Taylor, have used this method in the cultural field with striking results. I suggest that the historians might find it increasingly meaningful. Indeed, they are doing so; for that is one of the outstanding features, if I am not mistaken, of Latourette's recent *History of Christianity*. There he seems to feel that the geographical reach of an idea has frequently been so important as to indicate the main stages in its development and *become normative to its historic description*; certainly he appeals to geography as a measure of the varying success of the Christian Church.

Perhaps one could even go so far as to suggest that the very quality of that faith grew in stature as it grew in extent. There was something significant in the very act of reaching out itself. Geography proved, experientially, what in essence was recognised to be a universal faith. If this conclusion is a valid one, then the use of geographical expansion could well become normative for establishing the great periods of cultural progress. History would become the growth needed to make geography, or, if one preferred it, geography would be the scope required to make history.

THE USE OF DISTANCE

When distance is treated as the extent to which objects adapt themselves to, or dominate, their environment, then it offers valuable clues to their relationship with the environment, a relationship that leads geography on from description to explanation. It is when the geographer plots his description in terms of distance that he has a

yardstick to use for explanation. But till then, he is very much in the dark, and is in danger of making false correlations.

To be more specific, let us take the study of the arctic—a characteristic type of country at the polar extremities of the world, made up of a stunted vegetation of lichens and mosses, on permanently frozen soils, where even the summers are cool. Plotting this type of country, the geographer finds several interesting distributions, such as that it extends far further from the poles in the northern hemisphere than it does in the south; in our hemisphere it extends further south on the east side of the continent than it does on the west; its furthest extent is around the shores of Hudson Bay, in Canada.

The larger grouping of land masses in the northern hemisphere, and the onset of northeast winds and currents, moving from polar regions, were early recognised as responsible for the major disparities. However, the reach of the arctic to as far south as Akimiski Island, in James Bay, that is, to about 55° N, long went without adequate explanation. It seemed an anomaly, especially when men assumed that Hudson Bay, to north of this, contained open water even in winter. The anomaly was so great that eventually observations were checked more thoroughly, when it was found that the Bay was, in truth, frozen; the explanation which the facts alone warranted.¹ Here was a case, then, where the explanations led to better geography.

Usually it is better geography which leads to the explanations. Part of our difficulty in trying to make geography a science is that we have unduly limited ourselves in what we consider to be geography, and therefore have come short of really satisfying conclusions. Perhaps this is because most of us have only the time to examine one aspect, and consequently do not appreciate the other sides of our subject. But the plotting of geographical distance leads almost inevitably to correlating it with *all* aspects of distance, and thus a most helpful side of geography is developed. Griffith Taylor has referred to geography as the 'correlative' science. For, in its study of the physical and human environment, it learns from and, indeed, comprises part of other disciplines, particularly as it emphasises distances and distributions. To plot these and understand them it is led to explore the other sciences for the distance and bounds with which they are concerned. Since many of these, like astronomy, geology, climatology, pedology and plant ecology, have similar methods, they strengthen the scientific tradition in geography. They have kept geography within physical, determinable limits, and given the subject its interest in the physical environment in all its totality, which is one of its chief glories.

However, that should not restrict geographical research to the physical effects of the environment, or, rather, to the effects of the physical environment. Important though these may be, and they are, they are not enough to explain all the phenomena. Other and greater distances open up. Physical factors may explain the distribution of an area like the arctic sufficiently well, because it is related primarily to other physical, or natural, phenomena, such as the reach of polar air masses, polar ocean currents, etc. The distance to which the arctic has extended is due almost solely to physical factors.

If we had to explain the distances reached by the desert, however, we would come upon a very different story. The deserts are more complex. They can be related to human factors to a much greater extent. The desert scene has reached further than the strictly desert climate. It has extended to where ignorant agriculturists and improvident pastoralists have destroyed the plant and animal life holding back the desert;² it has become involved in the human race, in economics, in sociology, in politics, in history. Wasteful economies or systems of social organisation have let in the waste, and so enlarged the bounds of the desert. Man has been the deciding factor, not nature.

There are many other cases where man has tipped the natural balance. In another instance, that of the struggle between bog and forest in the Scottish Highlands, I have indicated that man's intervention accounted for the expansion of the one against the other in a not uncertain way, particularly where commercial sheep farming replaced the old economy.³

As we learn to measure distance better, therefore, as we try to separate out the distances to which *man* has pushed out a boundary, and add it to the distance which *nature* can account for, we shall provide a better explanation of the facts.

THE HUMAN FACTOR IN DISTANCE

The concentration on man-made distributions in geography must surely be regarded as one of the main advances in the subject during the last half century. It has come to complement the study of natural distributions, and thus alleviated any tendency to overstress sheer physical distance, or, I should say, the physical factor in distance. It has taught us to see distance in human terms, especially in economic terms, as a measure of the success or failure of this or that economy. Distance is not related to land mass, so much as to land-man ratios; it is not set against climate, so much as against the climate of ideas.

May I go back to Canada again for an example vastly different from that of the arctic. It concerns itself with the distribution of the Niagara fruit belt, a small but not unimportant region of southern Ontario. Having expanded the maximum distance which temperature and topography would allow, it is now shrinking in size, its margins are retreating and it is threatened with probable extinction. We can imagine that an observer at a hundred years' remove, looking back on its disappearance, might be inclined to think that the climate had turned cooler. Peach cultivation is insecure where the July temperature falls below an average of 70°, or where winter minima are less than -15° F. It would only take a fall of two degrees to plunge the Niagara climate below these critical limits and thus endanger the peach-growing economy.

Our postulated observer would be puzzled to find, however, that the climate had warmed up, if anything, and not grown cooler. That is the present trend.⁴ He might have wondered, then, how the orchards had dwindled and died out; that is, unless he had been observant enough to read the climate of the mind. Then he would

have seen that, over a generation or two, the fruit farmers had struggled, not against isotherms, but against urbanisation, and against the urban mentality which subordinated all uses of land to the business or convenience, the profit or pleasure of the Niagara cities. As I have indicated elsewhere, "Many orchard growers have given up farming and sold out to urban interests in Hamilton or St. Catharines because they have got the idea that the complete invasion of the fruit belt is inevitable. Once a substantial number think that way, then the whole climate of opinion may alter, and we may say goodbye to the fruit belt with as much finality as if a new glacial age were advancing on us."⁸

Many geographers have shown how and to what extent climate has affected the distribution of plant and animal life, together with that of man and his works; I have yet to discover a systematic treatment of what the mental climate has done along these lines. Yet I am convinced that the mental climate is, in many cases, as important, if not more so, than the physical one, leading to the destruction of certain plants or animals and the preservation of others, over quite large areas, chiefly for reasons of human taste. Until we get maps of isothoughts, if I may be allowed to coin the word, as well as isotherms, that is, maps of the bounds of certain types of thinking, we cannot explain the distributions of plants and animals. Too often agricultural belts are taken to be matters of temperature rather than temperament; yet if temperament were to be studied geographically, it could be shown to have much to do with the taste for, and therefore the distribution of, certain crops and animals.

For example, the widespread use of reindeer in northern Europe and Asia led people to conclude that they would be as widely used in North America, if introduced. But the temperament of the Canadian Eskimos is against herding, as many observers have noticed, and so only an insignificant number of reindeer have been bred and domiciled in the Canadian arctic.

As geographers explore the avenues of what man has done, they see him introduce factors of distance, or even types of distance, that have less and less to do with physical causes, and more and more to do with economic and social ones. Consequently, geographers have been led from the physical to the social sciences.

THE SIGNIFICANCE OF COST DISTANCE

For instance, in studying roads and railways they have had to qualify 'geographical' distances by 'cost' distances. As communications became more important in human affairs and, indeed, took on a vital rôle, cost distance came to exert a preponderant influence in human geography, particularly in the distribution of economies and social and political systems. The much reduced cost of contacting the riches of the East by sea, instead of by overland caravan routes, helped in a substantial way to reorientate Europe to the Atlantic. In fact, cost would probably have instigated, in any event, what the Turks are usually credited with having done, namely, started the westward course of Empire among Europe's more aggressive

nations. Even had the Turks not cut the caravan route to the East, cost would have done so, once the seaways of the world came into full competition with the landways.

I think it would be a fascinating exercise to trace the effects of cost distance upon the rise and expansion, growth or fall of nations, or at any rate of nations as geographical entities. However, I must admit to being less familiar with these larger fields than with the field of the city. Here it was shown, thirty years ago, that the economic competition for space was one of the chief causes, if not the principal one, of the location, function and form of the city. It should be added that the idea was American, and applies mainly to America. It has yet to be worked out for the cities of the Old World, although it is possibly true enough of our great commercial and industrial settlements.

The argument is, in brief, that the city grew up at, or at least centred itself in, the cost centre of its region. It maintained itself by maintaining that centre as the point of lowest cost access to the highest profit area, in terms of the particular raw materials, markets, skills and services at its command. It thus came to create a spatial pattern which was the reflection of its economic order. Burgess suggested that that was essentially a zonal pattern, the zones of urban development coinciding with zones of increasing or decreasing cost.

The nucleus of every city was the point for which there was greatest competition, it being the point of lowest cost access to all the varied demands of the region. It was by no means the geographical centre, either of the city itself, or of the region. Factors other than mere geographical distance came into play. The geographical centre, the point of easiest linear access to the city and region, might be displaced by political boundaries, by the system of land survey, by the vagaries of land speculation, and by other unique factors, each of which could raise its cost and so lower its value as an economic centre.

Thus, the centring of cities and the development of urban zones were essentially economic. This is an important point in the Burgess theory of urban growth, especially so, if interpreted in terms of cost distance. The theory has been generally ignored or criticised by geographers because it never seemed to accord with the azonal, irregular pattern typical of most settlements. Usually the actual, geographical form is anything but zonal. It may assume a stellar form, or be quite unique. In a city which I long studied, Hamilton, Ontario, a most irregular pattern obtained. In the east the working-class residential area stretched out further from the city centre than one of the best residential areas in the south. On the face of it, this was anything but the concentric arrangement of zones postulated by Burgess. However, close observation showed that the working-class district, nearly two miles to the east, was much less costly to reach, particularly during the days of city expansion, than the first-class area, about half a mile away. The latter district was along the slope of a steep escarpment beyond the city trams and was therefore almost exclusively the purview of those who could afford a carriage and pair. Even after trams entered the district, most people used their own conveyances; and in any case, by then, the area had become a high

cost region to live in for other reasons—land was dear to buy, houses were heavily taxed, and so on. Thus, a person living at 'X' in the first-class district was actually thrice as remote from the city centre as another living at 'Y' in the working-class zone, though twice as near in terms of geographical distance. Consequently, X lived in the outermost cost zone, and in this respect, was like residents of commuter suburbs on the edge of the country. (See Fig. 1.)

Of course, it might be argued, in this case, that cost distance was but a reflection of the topography: it went back to physical geography. The areas of highest cost lay along the slope of the escarpment, which was the area of least access. This is true enough. However, the significant thing is not the slope itself, but the amount of work needed to climb the slope, or, more important still, the work entailed in main-

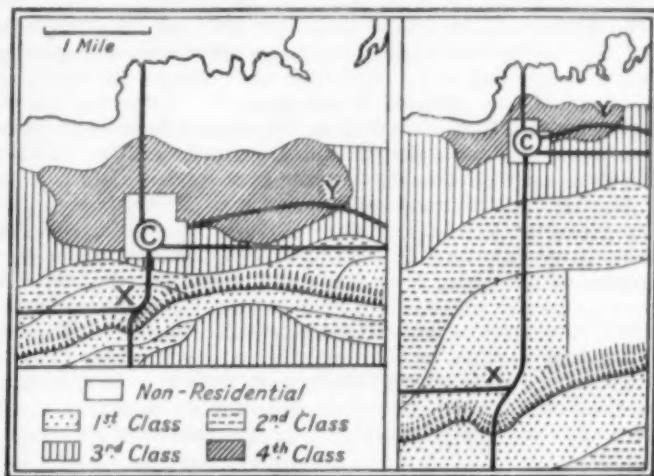


Fig. 1. A comparison of physical and cost distance and shape, Hamilton, Ont. The physical elongation of the city is east-west; the cost elongation, north-south.

taining oneself, one's house, garden, car, one's share of road, sewage etc., upon this slope.

Cost distance is much more than a matter of slope. In fact, it is a good deal closer to a people's psychology of slope than to slope itself. For some reason a slope with a commanding view is sought for, indeed, fiercely competed for, in a Canadian city. From what I have observed of Rio de Janeiro, where some of the worst slums are up on the hills, this is not the attitude of all people. But since it is the ruling attitude in Hamilton, it has its cost.

To go back to our example, if we assumed that the steepening of the slope lengthened the distance in, i.e. increased the work of, reaching the homes on the escarpment by two or even three times, compared with those on the plain below, we still would not have explained why the costs of lots were six to seven times higher, or taxes were nine to

ten times as great ! Economic and social factors have increased the cost of living on the escarpment *out of all proportion to the physical distances involved*. They have thus created something new, a new environment, a new geography : cost geography.

Geographers have become so familiar with the physical shapes of cities, or countries, that they have often found it difficult to appreciate the *cost shape*. Yet the cost shape may be the *real shape* of a place in terms of daily living, or at least of many of the most important living considerations. Chauncey Harris has made a beginning in his study of the economic proportions of the United States, and has drawn a series of maps showing the size of each State as a measure of its economy. The economic size is something very different from the actual one.⁶ But the States must vary equally as much in *cost shape*. Thus, thanks to the dominance of east-west routes in North America, most States must be much narrower along their east-west axis in terms of cost distance, than along their north-south one, whatever the actual distance may be.

An aspect of cost distance is *time distance*. Generally low wage earners cannot afford the time to be far distant from their place of work, as compared with professional and business men. This is a main factor in distinguishing the rooming-class zone from the commuter zone. But in the commuter zone, there may be fierce competition between places on the basis of time distance. In this connection, a recent study of time and distance around Edinburgh made by Mr Macgregor, of the Geography Department, showed that some sites were much closer in time to the city than neighbouring ones and that, in certain cases, towns or villages physically nearer to Edinburgh were nevertheless more remote on a time-distance basis than their competitors.⁷ Obviously, then, isochronous belts have little to do with geographical equidistance, but create distributions of their own, which are the really valid ones in explaining the distribution of the commuter population.

Perhaps that is enough to indicate that the geographer's measurement of distance, and that his study of resultant distributions, must be qualified by the cost factor, wherever man is concerned. In many circumstances his distributions are much more likely to result from cost considerations than anything else.

THE SIGNIFICANCE OF SOCIAL DISTANCE

However, he should realise that just as there are economic distances which have little to do with physical ones, so there are social distances which have little to do with economic ones. There *are* anomalies in the cost-zonation of cities which are difficult to explain except by social barriers. Thus, whereas by all the laws of economics, residential areas near to an expanding urban centre, should give way to commercial uses of land, or at least to a transition zone where residential and commercial uses interpenetrate each other, purely social forces may arise resisting such a change, and compelling change to go in other

directions. Social barriers of this kind may be immense. And they may be very real: just as real in fact as the barriers of cost, or as physical divides. Indeed, in most highly developed regions, human watersheds are just as significant to a geographer's distributions, channelling the flow of ideas, interests, associations, customs and activities now to one side of them and now to the other, as natural watersheds. I have said in another connection, that geographers should concern themselves with the social Himalayas of the world as much as with the physical ones.

Let me refer again to Hamilton, if I may. A study was initiated there by Professor Ruggles and myself of 'work force' in relation to 'work place'. In one case the workers of a certain textile plant, placed towards the west of the city, were found to live mainly in its central or eastern parts. (See Fig. 2A.) The plant was divided from the west end of the city by a fairly deep and wide ravine, which was taken to be reason enough for the very asymmetric distribution of the work force. However, a bridge had been built across this ravine more than

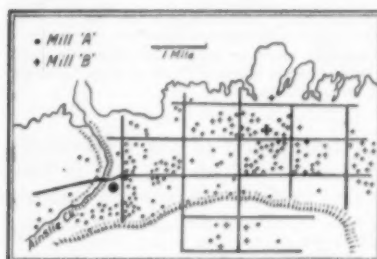


Fig. 2a.

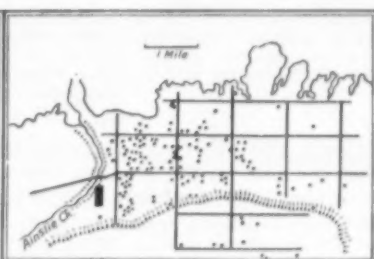


Fig. 2b.

Work-place and work-folk in Hamilton, Ont. Note how the workers of Mill A, Fig. 2a, and of the Frid-Chatham industrial area, Fig. 2b, live in the main well to the east of their place of work. This is due to social geography rather than to the supposed barrier of Ainslie Creek.

thirty years ago, and it was *physically* as convenient to live west of it as east of it. In the last thirty years a good number of workers might have been expected to have located in the west, yet they had not done so. The *cost factor* was thus called upon to explain the situation. There was no tram west of the bridge in the early days of the city's westward expansion, and this may have made it costly for workers to have lived in the west. But the tram soon went in and it is now as cheap to reach the plant from the west as from the east. Indeed, it can be reached at half the cost in *time*. Nevertheless, few workers have taken up residence in the west.

More recently a whole new industrial area has grown up within the bottom of the ravine. (See Fig. 2b.) It is physically as convenient and financially as cheap for people to reach the bottomlands from the western edge of the ravine as from the eastern, yet virtually no workers, employed at these plants, come from the western bank. They have

preferred living in the east of the city, although, as I have shown elsewhere, that is overcrowded and, in many parts, socially unstable.⁸ (See Fig. 3a, 3b.)

It is only when we invoke the factor of social distance that we can

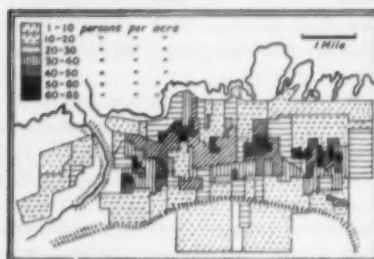


Fig. 3a.

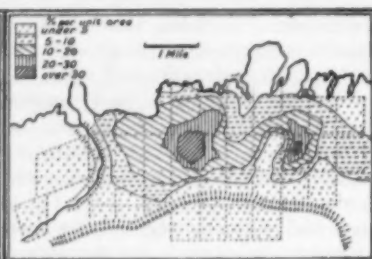


Fig. 3b.

Population densities and social hazards in Hamilton, Ont. The chief densities and hazards are to be found in transitional areas around the centre and eastern subcentre of the city. Note how free the west and south are of population pressure and social disintegration. Major social hazards used in plotting the map were marital discord, child neglect, juvenile delinquency, theft, drunkenness.

explain this otherwise extraordinary distribution of the work force. For the fact is, the western district was opened up by, and is now composed almost entirely of, business and professional men; it consists of Canadian-born residents, most of whom are of British extraction;

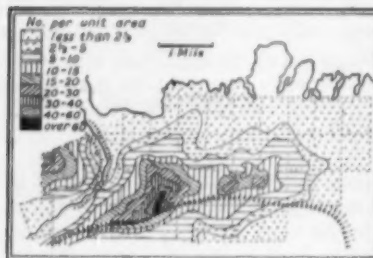


Fig. 4a.

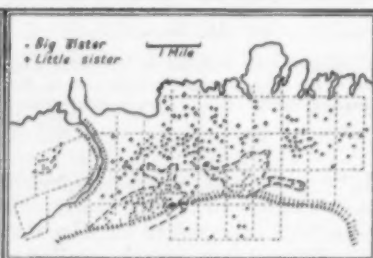


Fig. 4b.

The people of the western and southern suburbs of Hamilton, Ont., are the chief supporters of private school and university, and take a lead in charities. 4a shows the number of people per unit area (4 city blocks square) sending children to private schools and college. 4b shows the distribution of Big SISTERS, women of means who sponsor and look after LITTLE SISTERS, girl delinquents.

it contains the University, and most of its families send their children to College; many of them patronise Private Schools; they are expected to support charities on a substantial scale, and in many other ways, to take a lead in community affairs (Figs. 4a, 4b). They are

socially remote from the workers in the nearby factories who are, for the most part, unskilled or only semi-skilled personnel, who include a substantial number of foreign-born residents, mostly of Continental European extraction, and who are far from a position to support charities. On the contrary, their position tempts them to be interested in fraternities, co-operatives and credit unions. (See Figs. 5a, 5b.) These are the facts, not the ravine, which account for the peculiar distribution of the work force.

All this will indicate, no doubt, that there is still room for research on the geographical effects of social distance. This is the force that in so many cases has the decisive and last say in the geographical distributions in which we are most interested; in the distributions of frontiers, cultures, settlements, trade, industry, and population.

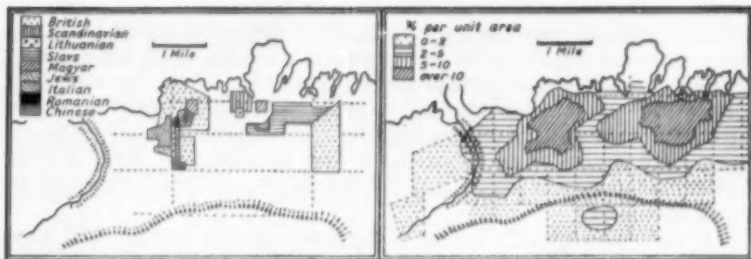


Fig. 5a.

Fig. 5b.

The northern-central and eastern parts of Hamilton, Ont., close to the commercial and industrial regions of the city, are crowded with immigrants. Ethnic societies, working-class fraternal associations, co-operative and credit unions are principal social organizations. 5a shows the distribution of the chief foreign-born elements in Hamilton's population; 5b the percentage of the total population per unit area (4 city blocks square) interested in co-operatives.

Sir Arthur Keith once implied as much in his study of race where he suggested that the early differentiation of racial stock was due, not so much to mountains and climate, as to strong in-group attachments, amounting in many cases to a sense of social superiority, that raised well-nigh impassable barriers to racial admixture.⁹ One compares this with the work of Grafton Elliot Smith in which he postulated the movement of ice caps, and also the oscillating effects of mountain ridges, as the separating agents.¹⁰ But it is possible that he got the racial cart before the psychological horse. It may well have been the powerful effect of social distance that first separated races from each other and made them retreat to, or stay within, the shelter of ice-rimmed basins. This is something still unsettled and therefore worthwhile investigating: where, and to what extent, and in what ways has social distance created the principal distributions between races, between economics, between nations, between cities and between neighbourhoods? At all levels of investigation the question needs to be asked, and the answers mapped, systematised, and explained.

SUMMARY

To sum up, then : in attempting to describe the earth as it is, the geographer sees two great categories of scenes ; those which result largely, if not altogether, from physical forces ; and those which derive from human activities, particularly from economic functions and social behaviour. Beginning to measure the earth in terms of geographical distances he is led on to the consideration of economic and social ones. In doing so he becomes more aware of the total number of factors at play in creating his spatial patterns and he is able to give a better, more comprehensive, explanation of the facts. Also, in doing so, he assumes his classic rôle of linking the physical sciences with the social sciences in what is truly a science of the earth. And finally, in doing so, he realises again how, and how much, geography has become the measure of man, measuring the reach of his success or the degree of his failure as man has struggled to extend his ideas, his ways, his numbers and his control over the world around him.

To my way of thinking this is what makes geography worthy of inclusion in the circle of higher learning. By its very nature, it impinges upon, and gathers from, so many modes of thought. Thus it is all but bound to assist a person in gaining a fuller and sounder view of the earth and man.

I say "by its very nature" because, as this lecture will have indicated, geography cannot stop at anything short of the whole of man in relation to all the earth. It is impossible to stop, for example, at the description of the physical environment, because physical distances make us most aware of their own shortcomings, and lead beyond the mere mathematics of latitude and longitude, or the geology of rocks and relief, the physics of the atmosphere, the chemistry of soil and the biology of plants and animals to those vast and shining vistas of man's intervention, endeavour and will. Here the geographer views the full impact of the human economy as it has stripped off forests, ploughed up grassland, laid waste the green and lovely earth or made the desert blossom as the rose. Emblazoned on almost every hill, and stamped into almost every valley, is the sign that man has made, and is constantly making, his own geography. And so the geographer must go on to those ultimate distances, traced out in history and expressed in society, where the people, in their hamlets, cities, and nations, through their customs, idiosyncrasies, and aspirations, indeed in all the manifestations of their being, change and master the earth, to make of it but the imprint of their own purposes and soul. Geographical distances are, in the last resort, the distances of the human spirit itself.

Seen in this way geography might be said to have increasing value in a world that all too often and all too much has lost the world view : in a world that will not admit the full distance to which the world reality itself is carrying us. Everyone knows that the social forces at work in the world, and the world economy, are such as to draw us, willy-nilly, into ever closer relationships. Yet at the same time people

do not prepare themselves, or what is perhaps more important, see to it that the schools and universities prepare their children, to try to understand and appraise this new world order.

If geography can help, as I believe it can, in integrating and co-ordinating facts learned from the whole range of scholarship, and if in doing so, it can assist us to see the world as it really is, and to see the world in its entirety, then I believe it will have earned for itself a rightful place amongst the highest disciplines of the mind.

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FOOD FROM AFRICA

Since the abolition of meat rationing in the United Kingdom and indeed for some time previously, the anxious interest in food supplies that so characterised the war and immediately post-war years has largely subsided. Even so, the recent opening of a three-quarter-million-pound abattoir at Lobatsi, in the Bechuanaland protectorate, some 50 miles north of Kimberley, marks an important advance in the exploitation of Africa's potential for food production. Vast herds of cattle—of a kind—exist in Africa but so far very few of these have been contributed to the world's food resources. The Fulani of West Africa reluctantly part with some of their herds and meat is a significant item of diet on the West Coast. In East Africa, on the other hand, the opposition of herding peoples to the sale of their cattle is well known and leads, through over-stocking and soil erosion, to serious reduction of the value of land. During the last decade, Bechuanaland cattle exports have risen from 43,000 to 75,000 with a value of almost £1½ million. Hitherto, cattle have moved on the hoof to the Union of South Africa, the Rhodesias and the Belgian Congo, and the resulting deterioration of the beasts, together with uncertainty of marketing arrangements, has been a heavy burden on the industry. This new abattoir, however, includes cold storage and processing plant so that we may expect from it a valuable and regular addition to the diet of southern Africa.

Research is proceeding into the problem of increasing drinking water supplies so that the Protectorates' herds, at present about one million strong, may be further increased.

R. M.

THE WEATHER OF 1954

H. H. LAMB

THE year 1954 will be remembered for a variety of unpleasant reasons. It produced the wettest autumn in Scotland since general records began in 1869. In England, the summer was probably the drabdest within memory, owing to the combination of wetness, coolness and lack of sunshine, though no new records were set up. 1954's combined summer and autumn rainfall was surpassed in England and Wales in 1872, but not since; in Scotland only the 1872 and 1938 figures were higher.

The late winter of 1953-54 was severe and followed what is believed to be the commonest pattern of severe winters, marked by a northward shift of the Siberian anticyclone towards Scandinavia after the turn of the year. February was the coldest month, as usual in such cases. This was a short winter, however, since December 1953 was exceptionally mild.

Easterly winds set in on 22nd January, and from then until after mid-February all parts of Britain partook to some extent in the exceptionally severe weather affecting the rest of Europe. -20°C (-4°F) was reported at Welshpool. Roads were blocked and villages isolated by snowdrifts, notably in Kent. Rivers, canals and lakes froze. During February the Atlantic depressions came east in $50-55^{\circ}\text{N}$ and crossed England, causing increasingly changeable weather, excessive rainfall, more snow in many districts and a deficit of sunshine over all. The month was particularly foggy in the English midlands and east. The greatest monthly temperature anomaly for February in Britain was -2.7°C at Eskdalemuir, but the deviations exceeded -5°C over the European plain east of 10°E and in central Sweden.

It was a noteworthy feature of 1954 that all five 'natural seasons' (Lamb 1950) were marked by long spells of set weather type:

Late Winter. 22nd Jan.-19th Feb. 1954. Easterly and cold Southerly weather types predominating, some cyclonic intervals. Severe.

Spring. 6th-29th April 1954. Dry anticyclonic, mainly Northerly and Easterly winds. Sunny, but cool with many night frosts. No day reached 20°C (68°F).

High Summer. 6th June-18th Aug. 1954. Rainy, Westerly and cyclonic weather type unbroken. No day during this period reached 30°C (86°F).

Autumn. 27th Aug.-12th Nov. 1954. Westerly type again; anticyclonic tendency in the south at first, cyclonic in the north throughout.

Forewinter. 23rd Nov.-28th Dec. 1954. Westerly weather, intensely cyclonic at first, becoming more North-Westerly and anticyclonic after mid December. Mild.

On average only three such long, set spells (lasting 25 days or more) occur in any one year. Thus 1954 was characterised by unusually

stable organisation of the atmospheric circulation patterns in each season. This persistence of type doubtless added to the hindrance to human activities in the regions affected by unfavourable anomalies. In Britain only one of the above-listed long spells was of generally pleasant character.

April alone was predominantly fine, and mean pressure exceeded the 1921-50 normal by so much as 12 mb. over Northern Ireland and Southern Scotland. This and an anomaly of the same amount just south-west of Alaska were the culminating points of a complete ring of excess pressures about the northern hemisphere in the latitude of the usual depression belt. This curious pattern went with an unusually intense development of the 'cold pole' over Northern Canada; the main depressions followed tracks rather close around this pole and very few came near the British Isles or into the eastern Atlantic during the whole month. In this country April was the driest and sunniest month of 1954. England had only 29% of the average rainfall, and the state of the water supplies was locally causing some concern.

May began the long succession of wet months (see Table 1); but its rainfall came largely from thunderstorms in the slow-moving troughs between succeeding Southerly and Northerly airstreams—a situation with no obvious resemblance to the succeeding months. The weather was still changeable, and the last days of May produced some of the very few warm days of the summer: 29°C (84°F) was reached in London on the 27th. Scotland's highest temperature of the year was 26°C (79°F) at Achnashellach on 3rd June.

TABLE 1. MONTHLY RAINFALL AS PERCENTAGES OF THE 1881-1915 AVERAGE

1954	ENGLAND AND WALES	SCOTLAND	NORTHERN IRELAND
January	88	100	93
February	132	98	149
March	117	89	117
April	29	66	34
May	130	160	163
June	142	143	111
July	126	105	129
August	141	103	74
September	138	156	162
October	122	190	191
November	190	149	149
December	90	134	120

From 5th June until almost the end of the year, Britain's weather was controlled by a long succession of depressions travelling east from the Atlantic across, or close to, these islands. There were only two important breaks in the sequence. Southern districts came within the influence of high pressure systems gradually extending east-north-east

from the Azores across central Europe into Russia from 25th August to 1st September, the latter being the only day of the year on which 30°C (86°F) was exceeded—actually in London. There was another anticyclonic interlude, this time affecting the whole of the British Isles, for a week or more in mid-November. Both these anticyclonic periods followed synoptic patterns which are notably common around the dates in question.

The depressions of high summer brought wet weather to continental Europe too, with rainfall up to twice the average in regions west of $15^{\circ}\text{--}20^{\circ}\text{E}$. In the Alps there were several snowfalls down to 800m. (2400 feet) a.s.l. in July and August, temporarily blocking the passes. The first half of July saw disastrous floods in Bavaria, Austria, Czechoslovakia and Hungary, following torrential rains on the lower levels. Parts of Bohemia and Saxony had three times the normal rainfall in July. Summer temperatures were low in the regions of excess rainfall, parts of Italy and southern France even being included: it was the second cool and windy summer running with no rainless season in the central Mediterranean. By contrast, Spain, where events commonly follow an inverse trend to the central Mediterranean, had many months of drought, lasting in some places almost to the end of the year. July temperature deviations reached -3°C in northern Italy and middle Germany, whereas all Russia was too warm, the anomaly reaching $+4^{\circ}\text{C}$ near the White Sea and $+3^{\circ}\text{C}$ in northern Norway.

Fig. 1 shows the average thicknesses of the 1000-500 mb. layer in July 1954. The isopleths on this map correspond to various constant values of mean air column temperature in the lower atmosphere: from this map therefore we see the pronounced thermal pattern of the 1954 summer, with two warm 'ridges' of outstanding size symmetrically placed over Alaska and Finland, as north-westward bulges of the main regions of continental warmth. Great cold 'troughs' lie immediately west and south-west of both the big warm ridges, actually over the Gulf of Alaska and North Sea-Baltic-central Europe; there are additional cold troughs over Labrador and central Asia. The June and July patterns were similar; by August the continental heating had largely got rid of the Siberian cold wedge and the north Russian-Finnish warm ridge weakened about the same time. This change allowed the Atlantic depressions right into Russia: for the high level winds and the tracks followed by surface pressure systems tend to follow the isopleths of the thermal pattern, especially where the gradient is strong.

The frequent occurrence in June and July 1954 of anticyclones over European Russia and western Siberia, near the heart of the heated continent, was perhaps the most unusual feature of the summer: even though their central pressures were only 1008 to 1020 mb. These 'highs' were associated with a displacement and extension of the usual north polar summer anticyclone (see the mean surface pressures for July 1954 shown as dotted lines on Fig. 1): already in May there was a pressure anomaly of $+12$ mb. over Novaya Zemlya. All through high summer anticyclones kept forming in the Urals sector between the warm ridge over north Russia—Finland and the central Asian cold



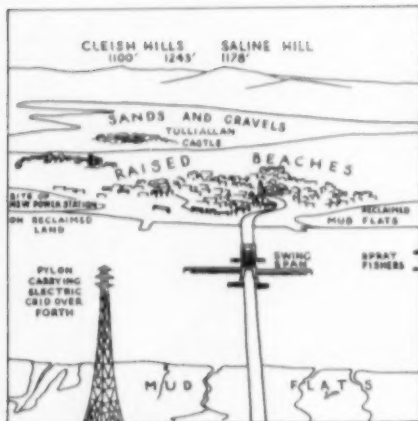
PL. 1. THE ESTUARY OF THE TAY NEAR NEWBURGH

The estuary occupies a breached anticline of which the north Fife hills (left foreground) form the southern limb and the southern Sillaws (right middle distance) the northern limb. Good farm land occurs on the raised beaches (centre) and makes an almost continuous fringe along the north side of Fife.

Photo by Robert Adam



Photo by Aerofilm



PL. 2.

THE FORTH ROAD BRIDGE, KINCARDINE: THE WESTERN GATEWAY TO FIFE

A low plateau of Carboniferous rocks is dominated in the background by hills of circumdenudation on volcanic rocks. The sands and gravels of the middle distance are glacial deposits which along the river have been smoothed into raised beaches and form good agricultural land. Coal seams occur under these beaches and contributed to the growth of the town but, being shallow, were worked out at an early date. Kincardine was a river port and ferry point. The modern bridge (1936) has the longest swing span (100 yards) in Europe. The projected power station will draw coal from the new sinkings in the Devon valley and at Airth and the ash is to be used to reclaim mud flats such as those in the foreground.

trough, a thermal situation known to favour anticyclogenesis; the anticyclonic circulation with southerly breezes over eastern Europe and northerly winds in Asia would in turn help to maintain the thermal pattern. It is tempting to consider whether this thermal distribution could have had its origin in the progress of the spring thaw and drying of the soil over Russia and Asia: March was unusually warm over Russia, and April was warm too in those north-east districts where the snow usually lingers in that month.

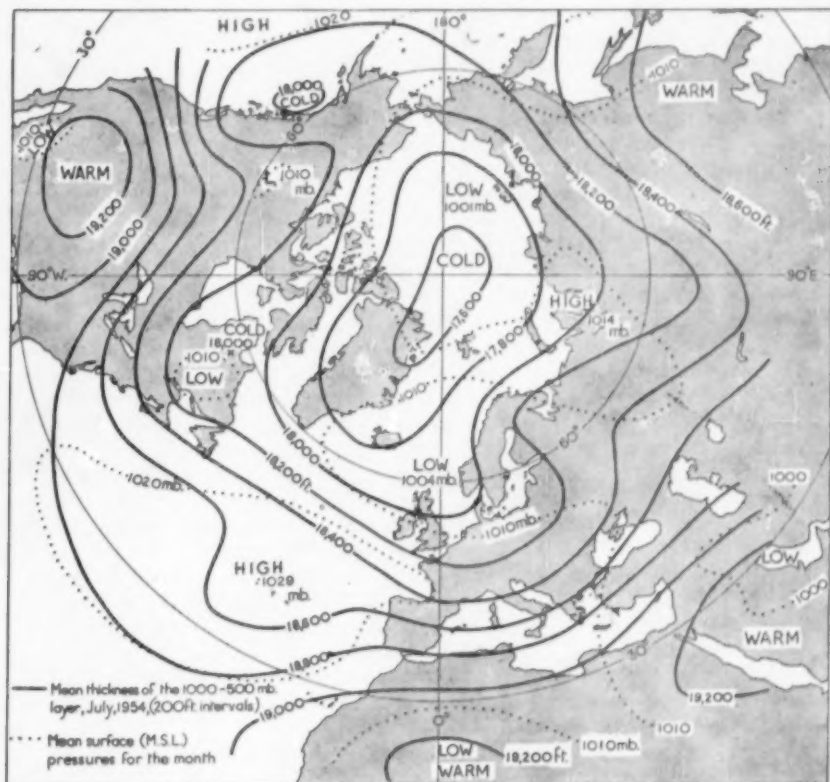


Fig. 1. Summer thermal pattern, 1954.

On this map the words High and Low are entered to mark the centres of the main features of the surface pressure map; the words WARM and COLD refer to centres of maximum and minimum thickness of the 1000-500 mb. layer.

There were no noteworthy anomalies of surface or upper air temperature in the tropical or sub-tropical zone in the summer, apart from a warm patch over the southern Rockies and U.S.A.

Autumn set in with an intensification of the westerly cyclonic

weather in Britain and Europe. The zone of strongest thermal gradient over the North Atlantic (and over the North Pacific), the jet stream (the mainstream of strong westerly high level winds) which broadly accompanies the strongest thermal gradient and the main depression track were all displaced south of their usual positions for the time of the year. The sea-surface isotherms all over the eastern North Atlantic were also south of normal, this being partly a legacy of the cool summer. Monthly mean surface pressures were low in September and October from south Greenland to Finland, the lowest values—997.8 mb. (8 to 12 mb. below normal)—being near Shetland. There was a corresponding positive anomaly, with pressures up to 6 mb. above normal, over Hudson Bay, north of the entrance to the North Atlantic jet stream. As the season advanced and the north-east Canadian cold trough sharpened, the strongest thermal gradient and the accompanying jet stream became concentrated over North America and the western Atlantic: the region of lowest surface pressures near the downstream end of the jet, still 12 mb. below normal, shifted west to near south-west Iceland by November, allowing some easing off of the rainfall over Europe.

For much of the autumn Britain came within the zone of maximum thermal gradient, characteristically the beaten track of depressions and frontal wave disturbances. This pattern meant *inter alia* that the mountains of northern Scotland had frequent snowfalls from 16th September onwards, whilst conditions remained mild in the south. The last part of October and early November, which bring Britain's regular late autumn rains and the most dependable rains of the whole year in southern Europe, saw the start of serious flooding of the already sodden ground in this country. In Italy, on 25th October, floods and devastation caused by cloudburst rainfall cost many lives in the Salerno-Amalfi district.

Houses in certain villages in south-west Scotland and the English Lake District, in Devon and in parts of Ireland, were flooded several times between late October and early December. Crops still standing in the fields were destroyed, roads and bridges were swept away. Few days produced more than 40 mm. of rain; repeated flooding in the same localities was due rather to a substantial repetition of the paths followed by depressions and smaller frontal waves, the soil being kept saturated. Oft-repeated, moderate falls are characteristic of sequences of polar-front depressions in autumn and winter.

In another year the nearest similar cyclonic sequence would be likely to show a displacement, however small, which would nevertheless be significant for the worst afflicted places.

Fig 2 shows the patterns traced out by the polar front at 12-hourly intervals from 15th (evening) to 18th October 1954, the time of the rains which brought out the first of the autumn's floods in Britain. The flooding about 29th October and 22nd November was also attributable to frontal waves passing north and north-east over Ireland and Scotland. Floods about 11th and 26th November and in early December occurred when the main Atlantic depressions crossed the country.

The most intense depressions of all were those of late November—early December, a singularly cyclonic period in many years: 944 mb.

was recorded in eastern Ireland on 30th November. There were several gales with gusts over 100 m.p.h., the highest reported was 107 m.p.h. (93 kt.) at Pembroke Dock on 30th November. Many lives were lost at sea, and the South Goodwin lightship was wrecked on the 27th.

On 8th December 1954 a tornado (very unusual so late in the year), accompanying a severe thunderstorm, destroyed buildings in west and north-west London. On the 9th there was a tornado in Innsbruck, Austria. These intense circulation phenomena have increased in frequency both in Britain and America since the early years of the century, but are no commoner than they were in 1870-99.

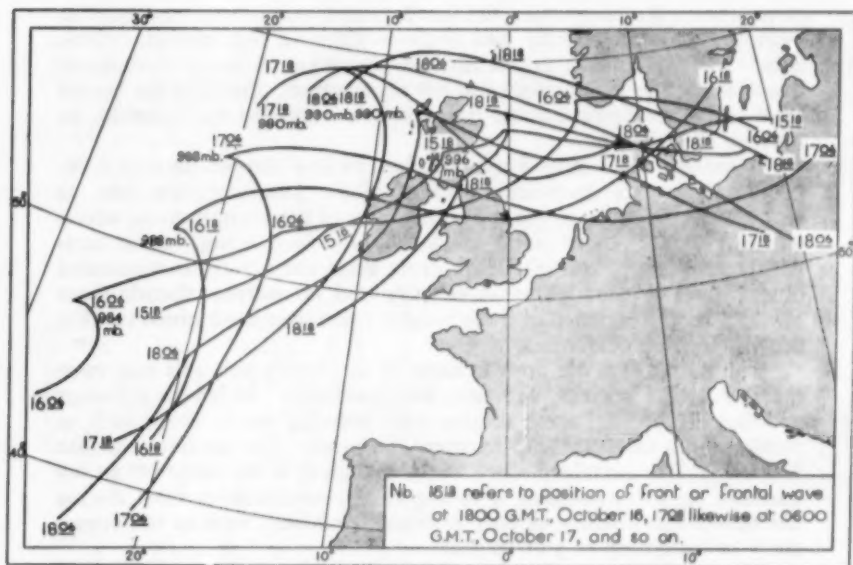


Fig. 2. The sequence of frontal positions at 12 hourly intervals, October 15-18, 1954. (Lowest pressure at any point along the polar front in this sector marked.)

The frequency of ordinary gales in Britain was greatest in the years 1934-39, 1938 being more outstanding than any recent year.

No review of 1954's weather would be complete without mention of the serious incidence of tropical hurricanes and typhoons, which cost hundreds of lives in America and Japan in September and October.

CONCLUSIONS

Let us take stock and view the year's experience against the background of our general climate and its range of variations.

Figs. 3 and 4 show 1954's temperature and rainfall at one English and one Scottish station, fitted into the sequence of earlier years. Eskdalemuir Observatory, Dumfriesshire, 794 feet up in the Southern Uplands, is representative of the districts which had the greatest excess of rainfall, apart from two small areas about Preston, Lancs. and in the Lake District: at Kendal only in 1792 had more rain been recorded.

It seems legitimate to ascribe local extreme excesses of rainfall to the chance effects of small-scale details of the atmospheric circulation, such as would always come out somewhere in any year with a fairly considerable anomaly over the country as a whole. In most places the 1954 summer and autumn rainfalls were of about the same amount as previous extremes within the last hundred years or so, and had, at most, been exceeded only two or three times in that period. (This means that last year's experience was not so extreme as to demand some relation to the hydrogen bomb experiments, although the World Meteorological Organisation has properly regarded the question as open to investigation.)

A careful reading of Figs. 3 and 4, and of similar data (not reproduced) for the individual seasons of the year, suggests that, as regards temperature, it was the general run of the years 1930-49 which was abnormal: there being no parallel for such a high mean temperature over any run of twenty years since the earliest instrumental observations in the eighteenth century and no warmer decade since the 1770's. Experience of these twenty years may have given us all a false impression of normalcy.

The minor climatic improvement of the 1930's and 40's was most marked in the springs, summers and autumns. It led to a longer growing season and some success with growing exotic crops such as peaches on a small scale in southern England. The summer warmth has not been maintained since 1950, though it is too early yet to say whether we are witnessing a return to the conditions normal during the nineteenth century or only a minor 'wobble', such as the curves show in any group of 5 or 10 years.

The twenty years of improved growing season overlapped with an even longer run of generally mild winters from 1897 to 1936. During those forty years only two winters (1917 and 1929) were severe, as against four or five since 1937. The winter mean temperature (December, January and February) in southern England over the last 20 years has been nearly 1°C (about 1½°F) lower than in the previous 20 years. This has had important consequences in terms of the frequency of snow lying, which had ceased to be of much account in the most populous districts of Britain in the mildest winters of the 1920's and early 30's. (The snowfall of December 1927 which disrupted communications was an isolated exception.) Speculative builders built houses with roofs incapable of keeping snow out, and plumbing was freely exposed to the weather.

Fig. 5 gives an impression of the changed importance of snow in our winter climate and of how far this is concentrated in individual bad years.

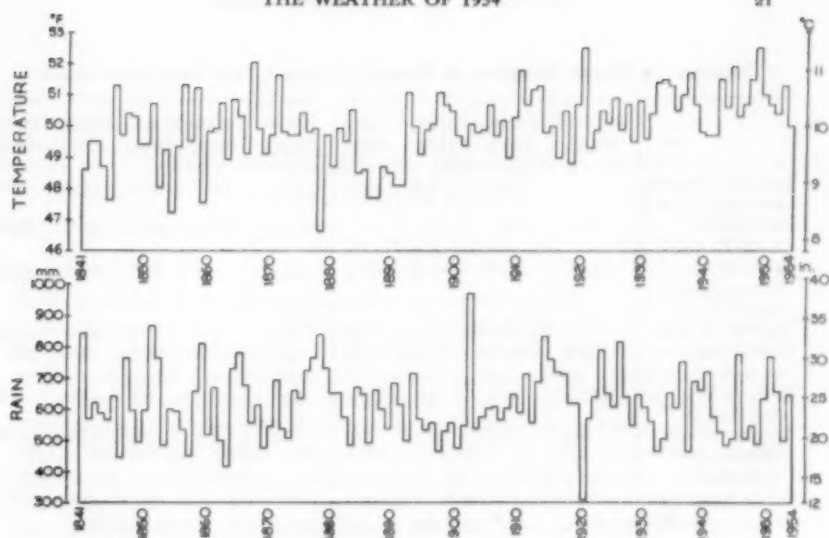


Fig. 3. Temperature and rainfall : London : annual values.

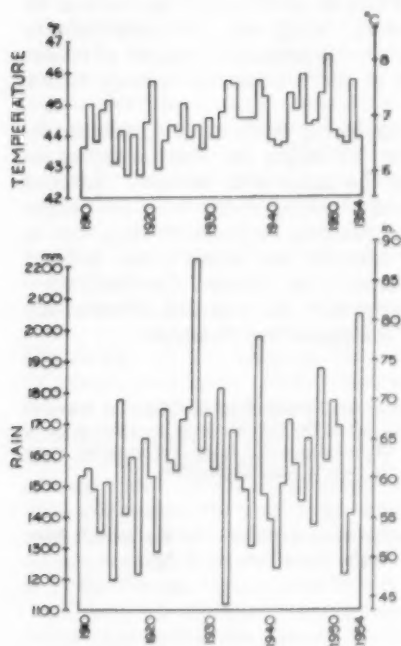


Fig. 4. Temperature and rainfall : Eskdalemuir : annual values.

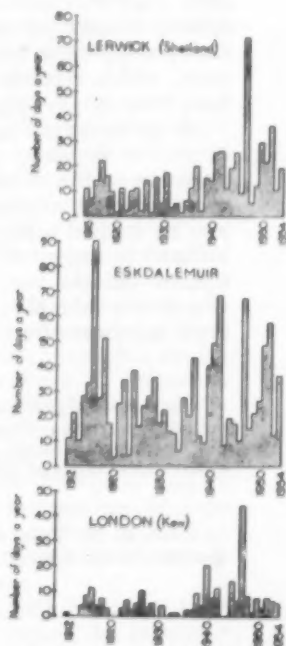


Fig. 5. Number of days a year with snow lying.

TABLE 2. 5-YEARLY AVERAGES OF NUMBER OF DAYS A YEAR WITH SNOW LYING

	(1912-1914)	(1915-1919)	(1920-1924)	(1925-1929)	(1930-1934)	(1935-1939)	(1940-1944)	(1945-1949)	(1950-1954)
Lerwick Observatory 269 ft. a.s.l.	—	14.0	6.8	8.6	6.2	10.8	19.0	24.4	23.0
Dalwhinnie 1,176 ft. a.s.l.	—	—	—	—	(51.5)*	68.4	56.4	51.8	64.6
Eskdalemuir Observatory 794 ft. a.s.l.	14.0	45.8	16.6	28.2	14.4	22.2	36.8	26.0	35.8
York 57 ft. a.s.l.	—	(10.3)†	9.4	12.4	8.6	14.6	25.3	21.2	14.8
Cambridge 41 ft. a.s.l.	4.7	17.6	3.0	8.4	4.2	7.8	16.0	16.4	7.6
Ross-on-Wye 223 ft. a.s.l.	(1.0)‡	10.8	3.2	7.2	2.6	5.6	8.6	12.0	9.2
London (Kew) Observatory 18 ft. a.s.l.	0.3	6.8	2.4	5.0	1.2	3.4	7.6	14.6	5.6

— Record fails.

* 1931-34.

† 1917-19.

‡ 1914 only.

The 5-year averages of snow frequency in Table 2 show figures since 1940 that are two to three times as great as in the period of mildest winters (except at Dalwhinnie). 1954 was not a particularly snowy year, but it was in keeping with the general character of recent years, which resemble the records of the nineteenth century rather than those of 1897-1936.

In planning our agriculture and in laying down building standards, as well as for many other activities, we might do well to pay some attention to the climatic records of the nineteenth century. Lessons of continental experience of highway management in snow might also be studied with profit. Indeed, writing in January 1955, one is inclined to suggest that familiarity with the use of skis in the isolated upland villages and farms—as formerly at Alston, Cumberland—would be a valuable safeguard in emergency and a means of extracting some enjoyment from an otherwise disappointing situation.

The author is indebted to the Director of the Meteorological Office for leave to publish this article. He would also like to thank Dr J. Glasspoole and the staff of the British Climatology branch of the Meteorological Office for making their observational material and an account of the year's rainfall possible.

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THE WEATHER OF 1954 AND THE SCOTTISH FARMER

A. R. WANNOP

It is doubtful if any Scottish farmer said good-bye to 1954 with regret. The latter six months of the year were a tribulation to all arable and even to pastoral farmers. It is, of course, very easy to exaggerate unintentionally the ill-effects of bad weather. After a sudden severe frost at blossom time we invariably hear stories of disaster and prophecies of a home fruit famine in the following autumn. And yet when the harvest does come, there is usually a crop to secure. But just as we may overstress possible harm, so we sometimes fail to foresee the long-term effects of bad weather. No symptoms may be seen at the time, but they may be obvious in the next and subsequent cropping years.

Actually the spring of 1954 promised well. At the beginning of May crops were forward, with every sign of an early harvest and promising yields. Thereafter the weather was generally wet, cold and sunless. Despite this, crops matured well though slightly late, and estimates of likely yields were good and up to normal. The losses began when harvesting commenced. We often have years when one crop or another is difficult to secure, but in 1954 this applied to them all without exception. Hardly ever can more overtime have been necessary or farm staffs have been more harassed. Even yet it is impossible to assess the full effect, but a survey of how the season affected individual crops may give an idea of what is involved.

The first crop harvested in Scotland each year is that of grass for conservation for winter fodder for cattle and sheep. Traditionally this has been the hay harvest, which took place in July in the main arable areas, but was as late as August and September in parts of the West Highlands. Newer ideas on what constitutes quality, improved strains of grasses and more liberal fertiliser treatments have all helped to advance hay-making, much of which now begins in June. Proportionately in 1954 hay probably suffered greater loss from rain than any other crop, a vital matter to the cattle and sheep breeder. In an average year, Scotland produces rather less than 1,000,000 tons of hay, about 800,000 tons of oat straw and about 250,000 tons of grass silage. In terms of dry fodder the silage represents little more than 50,000 tons of hay, and since some of the straw is used for litter, hay is by far the most important fodder crop we have.

This is not the place to describe hay-making, but those who have taken part in it know that its various operations expose the grass and hay to quick deterioration in wet seasons. In 1954 the crop suffered at every stage. Cutting was usually delayed until the crop was overripe

and therefore less nutritious. After cutting it often lay on the ground for weeks before it could be gathered in coles or ricks, all the time being both bleached and leached by rain. Grass began to grow up through the lying swathes, thus making drying and handling more difficult. Some crops had finally to be abandoned as useless, though most were gathered into ricks in the end. Even then some were washed away in floods. In Scotland the rick is an essential part of the drying process, enabling wind and sun to remove the last excess moisture. But an atmosphere already laden with moisture cannot do this, so the ricks of 1954 stood in the fields for months instead of weeks, acquiring blackened exteriors and with interiors continually damp. If the temperature had been higher, there would have been considerable development of mould, making the hay highly unpalatable.

It is only fair to say that though this was true of most of Scotland, there were a very few isolated areas where some good, though over-mature hay was made. Generally, however, hay-making was a disaster, the final product being deficient in quantity, its feeding value low and its palatability even lower. Some of the pastoral districts which are most dependent on hay suffered the heaviest losses.

In the last ten years an alternative method of conserving grass in the form of silage has gained ground. This preserves grass in its wet state, instead of dry as in hay. Obviously for this a rainy season has not the same drawbacks, and those who have adopted silage as an alternative to hay scored in 1954. But they did not escape altogether, since silage made in rain or when the crop is excessively wet does not make so well and is less palatable. Those who suffered least loss in 1954 were the farmers, extremely few in number, who make artificially dried grass. Costs of drying this must have been higher, since much excess moisture would need evaporation, but all reports indicate that 1954 dried grass has higher protein and carotene contents, the two important quality indicators, than in any previous year.

Most people look upon the cereal harvest as the important one of the year. To the outsider it is the most spectacular, and to the farming industry the value of its grain and straw far exceeds the value of the hay crop. When cut, however, the cereal crop is mature and ripe, and is less influenced by bad weather than green leafy grass cut for hay. Cereals must, however, be dry when cut; if they are not cut by the time they are fully ripe, the grain may drop from the ear to the ground and be lost; strong winds and heavy rains will batter the crop to the ground, often twisting it in every direction so that it is very difficult to harvest; while if the weather is both wet and mild, grain near the ground or in stook may begin to germinate and thus be of little value.

In 1954 all these factors handicapped farmers to some extent. Rain prevented cutting at the optimum stage and many crops were flattened by storm. Crops that were cut and stooked stood in the fields for weeks being drenched every few days by fresh rain and drying very slowly. Whenever a sunny day or a dry interval occurred, farm staffs had to snatch what they could of the dishevelled and discoloured crop, but it was seldom in good condition. Those farmers who use modern combine harvesters instead of the older self-binder for cereals,

and many do for the barley crop, found few days when the crop was dry enough to cut, and artificial drying of the threshed grain was always necessary to prevent it heating in storage. In fact in 1954 the combine, normally looked upon as an advantage in bad harvests, was in some senses a drawback. The crop must always be 'dead' ripe for the combine, which means leaving it for a week or two longer than one would for cutting with a binder. But the continued rain last autumn made the ground so sodden that on some soils the combine, a very heavy machine, simply sank into the ground and stuck. Many remained in the fields stranded alongside an uncut and flat crop until the last two weeks of December, when drier conditions prevailed and some crops were salvaged. A few upland districts, however, had some uncut oat crops that became so valueless that they were hardly worth salvaging.

Summing up the cereal harvest, it may be said that though it was not everywhere the most protracted, it was possibly the most exasperating most farmers have ever known. The final harvested crop was most costly to secure, but when threshed, the grain yield was surprisingly good in quantity, though it had suffered in quality. On the other hand the threshed straw from the oat crop, on which many farmers depend for winter cattle fodder, was very poor and even had a low value for use as litter.

Our other main harvest is that of the root crops: potatoes, sugar beet and turnips. Extensive growing of the first two is mainly localised in the East of Scotland, and sodden soils made harvesting slow and difficult, though both yielded good crops. The main potato harvest is normally overtaken in three weeks or so in October or early November but in 1954 it lasted at least eight weeks. Fortunately the cool weather prevented the spread of diseases which might have developed in crops that were under water for several days, and on the whole the crop proved fairly normal in quantity and quality. Sugar-beet does not suffer unduly from rain, but wet soil makes it more difficult to lift and more earth adheres to the roots and disappears to the beet factory. Lack of sunlight also depresses the sugar content. The turnip crop is harvested over a long winter period, and in general the 1954 crop had less finger-and-toe disease than often occurs when the growing season is unusually wet.

Because harvesting troubles can be so exasperating, one may overlook the other effects of a wet season. Farm operations on a wet soil destroy good soil structure, a thing to be avoided, and so autumn preparations in 1954 for the crops of 1955 had to be delayed. The little wheat that Scotland grows is usually sown in the autumn, but in 1954 even this small acreage was impossible. Similarly, the autumn ploughing of stubbles had to be postponed, which throws an undue burden of work on farm staffs from January to March if spring sowing is to be done timeously. Fortunately with modern farm equipment we can catch up on delayed land work with vigour and speed whenever the soil conditions are right. Drainage systems and ditches may also have been impeded by soil carried away by torrential rains, and need clearing.

Concern with crop harvesting should not make us forget that Scotland is primarily a live-stock country, that three quarters of our farm output takes the form of animals or animal products and that bad weather affects their welfare. We have noted that the hay, silage, oat straw and turnips grown are almost entirely fed to cattle and sheep in winter. In addition about 40% of the oat grain is retained for farm feeding or for seed. The rest of the cereal grains are sold, though some return to farms in compounded animal feeding stuffs. Thus when farm crops are short in quantity and poor in feeding quality, the farmer must buy additional foods either to keep up his usual output or to keep his animals in normal healthy condition. Either alternative makes him dig deeper into his pocket. The more diversified the farm, the more easily can he solve his difficulty. Those who suffer worst are hill and pastoral farmers with limited arable land, whose only crop often is hay.

In summer, live-stock do not suffer much in a wet season, though they may have less 'bloom' in appearance, and they may fatten less quickly. Grass is their main diet and rain encourages grass growth. It may have a higher moisture content, but it is plentiful. Stormy and cool autumns, however, mean much earlier housing of dairy cattle and others that are wintered inside, and this calls for a larger supply of winter food. It was the outwintered cattle and hill sheep that suffered most from the continuous rain and wind and cool temperatures of the late autumn and early winter of 1954. Having to dry one's overcoat nearly every day with the heat of one's own body uses up too big a share of the energy derived from one's food. They therefore started 1955 in poorer condition than usual. Unless more supplementary food is given in the latter part of winter, they may easily produce less vigorous calves and lambs in spring.

If we look on Scottish agriculture as one national farm, the balance sheet for 1954 was completely different from that of any of the previous fourteen years. Because of the weather, physical output of crops was less in quantity and lower in quality. Animal feeding at the end of the year was more costly, though animal output remained high. Financially the national farm suffered because higher labour and machinery charges for harvesting were necessary, the resulting crop was worth considerably less, both for sale and for home use, additional foodstuffs had to be bought for animal feeding, and maintenance work due to heavy rains and floods was well above normal. While this is true of the national farm, it is not universally true of individual farms. Thus the North-East of Scotland had on the whole a shorter and better grain harvest than Central and Southern Scotland, and secured a fairly normal crop. Because of the poor national crop, those who had oats for sale met a keen demand and a higher price than was expected. Similarly, live-stock farmers without a reasonable hay crop had to pay very high prices for supplies, and those with hay for sale did well. Just as the weather varied in its incidence, so the effects varied from district to district and farm to farm. But even those who gained slightly from crop shortages agreed with their fellow farmers that 1954 was a black year and hoped they would not experience the like again.

CHANGES IN POPULATION DISTRIBUTION IN THE COUNTY OF FIFE

1755-1951

JOHN C. DEWDNEY

RELIEF, climate and soil character in Fife, especially in the eastern part, are such as to provide one of the most favourable environments for agriculture in the whole of Scotland—a fact well illustrated by the county's early prosperity. Its relatively abundant mineral resources, concentrated in the south and west, have moreover enabled Fife to maintain a significant position in Scottish economy and adumbrate further development in the future. To these advantages must also be added that of geographical location in the eastern part of the Central Lowlands, a factor which has proved an asset of great value in the past and remains relevant at the present day.

In structure and surface features there is an essentially simple pattern, consisting of an alternation of upland and lowland zones with a predominantly WSW—ENE trend (Fig. 1). In the extreme north, the Tayside coastal plain is a narrow strip of lowland developed on the Lower Old Red Sandstone, covered for the most part with raised beach deposits which form excellent soil (Pl. 1). This zone is backed by a line of volcanic hills, which are an easterly, less prominent continuation of the Ochils, the highest points lying below 1000 feet and the general summit level at less than 600. Here, soils are for the most part rich and loamy, with a fair proportion of phosphate of lime, the predominant rock type being andesitic lavas with some tuffs in the west. Where boulder clay occurs, it incorporates a large amount of material from the country rock and thus does not appreciably alter soil type. The Howe of Fife and Stratheden lie between the well-marked edges of the volcanic hills to the north and the East Neuk plateau to the south. The edges of the basin have good soils where the 100 ft terrace is well developed, but there are patches of gravel and impermeable clays in the more low-lying central zone. In the past, much of the latter was ill-drained, with heavy, water-logged soils, presenting considerable problems of forest-clearance and reclamation, but to-day the region as a whole constitutes one of the most productive parts of the county. In the extreme east, the sand dunes of Tents Muir, fixed for the most part by coniferous plantations, lie on the 25-foot raised beach and form a unique exception to the general rule of high fertility along the coastlands. In the west, the Lomond, Cleish and Benarty Hills form the boundary between Fife and Kinross and are the only important areas of uncultivated upland, reaching a maximum height of 1712 ft in West Lomond (Pl. 2).

The higher parts of the East Neuk plateau, which is an upland area lying between Stratheden and the south coast, correspond (with a general level of 500 to 700 ft) to Ogilvie's Upper Lowland Peneplane and are composed of Carboniferous limestone and sandstone, with

considerable outcrops of igneous material. Generally speaking, the latter decompose readily, giving fertile soils which contrast with the somewhat colder, heavier soils of the boulder-clay-covered sedimentaries, so that the more productive areas tend to occur in the higher parts of this region. The south-western uplands also have a plateau-like form with a pronounced WSW-ENE grain. The general level is somewhat lower (400-600 ft) than in the East Neuk. Here again there is a contrast between the higher areas, developed on igneous material, and the intervening depressions, which are usually boulder-clay-filled, and often ill-drained with numerous small lochs and marshes.

The East Neuk coastlands include large areas of raised beaches, the 100-foot being particularly well-developed. Deposits associated with these beaches yield for the most part excellent soils, and the south-coast area, where they reach their greatest extent, has long been a highly productive agricultural zone. The south-western coastlands slope gently from about 350 ft to the sea and are developed on Carboniferous Limestone and Millstone Grit with some igneous intrusions. The soils are chiefly clays and loams and are of particularly high quality along the coast, where raised beach deposits again occur (Pl. 2).

The Leven Valley, which separates the East Neuk and south-western plateaus, is an undulating lowland, mostly below 200 ft and floored with Carboniferous Limestone and Coal Measures. Where boulder-clay occurs, the soils tend to be heavy and cold and drainage is difficult, but there are considerable areas of terrace and raised beach capable of intensive cultivation.

To these favourable conditions of soil and terrain must be added those of climate. Over 75% of the county has an annual rainfall of less than 35", large areas in the east have less than 30" and the eastern coastlands have between 27.5" and 25" only, while throughout Fife there are four months with mean temperatures above 50° F. Consequently, Fife is one of the most productive agricultural areas of Scotland, with the highest proportion of arable land of all the Scottish counties¹ and an unusually small area devoted to rough grazing. The latter occurs in considerable blocks only on the Lomond, Cleish and Benarty Hills and on Tents Muir. It also has the largest acreage and highest proportion of its arable land under wheat. This agricultural pre-eminence dates from the Middle Ages, when the coastal fringes were particularly productive, and is still an outstanding feature despite the superimposition on the agricultural background of more recent industrial patterns. The traditional description of the peninsula as "a beggar's mantle fringed with gold" is, of course, a reflection of these conditions.

Resources have been available for development under the different conditions of successive periods of history. Not only were there large areas of agricultural land suitable for cultivation by the medieval agriculturalist; there were also wide tracts, particularly in the interior lowlands, but also in the uplands, which could be developed by the 'improvers' of the eighteenth century. Furthermore, when the Industrial Revolution took place, it became clear that the most promis-

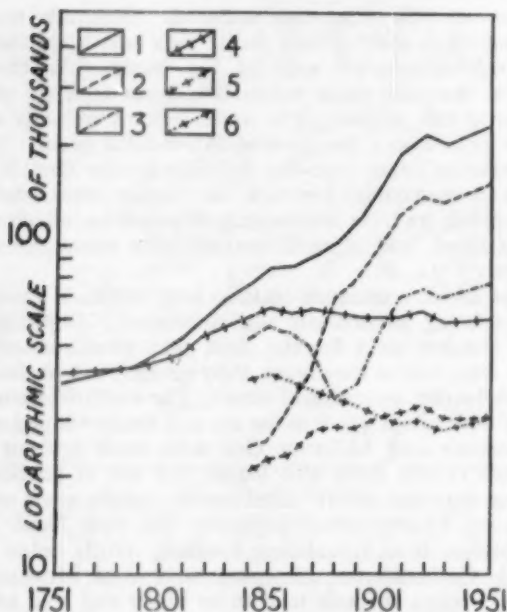


Fig. 3. Population change in the eastern and western sections of Fife.

1. Western section : total. 2. Western section : burghal. 3. Western section : landward.
4. Eastern section : total. 5. Eastern section : burghal. 6. Eastern section : landward.

ing areas agriculturally were not those in which the most productive coal seams occur, so that, although there was an inevitable loss of cultivable land, the bulk of the more fertile areas was preserved.

The contrast between east and west suggested in the last sentence has undoubtedly been one of the most outstanding features of the population history of Fife during the last two hundred years, a fact brought out by two simple statements. In 1755, the eastern half of the county contained 52% of the population, while the west, where the larger urban centres were situated, had 48%. To-day, the east is the home of a mere 20% of a considerably larger total. Secondly, while the population of the eastern area increased by 50% from 42,000 to 63,000 between 1755 and 1951, that of the west rose from 39,000 to 244,000, an increase of over 500%.² This change, from an even distribution between the two sections to one in which the population of the west is four times that of the east, must be the theme in a study of Fife's population history during the last two centuries (Fig. 3).

For a full understanding of the events of the eighteenth and nineteenth centuries, which established the present pattern of population, passing reference must be made to those of earlier periods. The peninsula of which Fife occupies the major part (but which also includes Kinross and Clackmannan) was ideally situated, geographically, for development as a major and semi-independent province of

early and medieval Scotland. Bounded on three sides by the sea and the broad tidal estuaries of Forth and Tay, and on the fourth by the land barrier of the Ochils and flanking carse-lands, Fife was to a considerable degree isolated from central and highland Scotland, yet open to sea-borne influences, so that her contacts were with the Lothians, England and the Continent rather than with the Celtic west. With the coming, by sea, of Roman Catholicism, many religious foundations took place, of which St Andrews is the best-known example. The various monasteries and abbeys, established for the most part in coastal areas, had a stimulating effect not only on the cultural life of the county but also on its economic activities, in that their occupants were energetic in the improvement of the land and the fisheries, and created a demand, albeit a small one, for luxury goods, thus encouraging trade. This impetus combined with the fertility of the area to produce important and varied commercial activities, the scale of which may be judged by the proliferation of Royal Burghs taking place between 1300 and the Union of the Crowns in 1707. By the latter date, these trading centres numbered no less than eighteen. The privileges held by these communities were a reflection of their commercial importance, and their number denoted a vigorous and fruitful trade. To-day, they are in many cases anachronisms: settlements with a population of two or three thousand, often less, with a status, in theory if not in fact, superior to that of much larger communities of more recent origin.

The distribution of Royal Burghs in 1707 provides a clue to the distribution of wealth within the county and thus to the general distribution of population at that time. The most striking feature was their peripheral arrangement: fourteen were on the coast; one, Dunfermline (Pl. 3), was less than four miles from it; and the remaining three were on the borders of the Howe (Fig. 2). Their great number was due, in part at least, to the broken nature of the terrain, a control particularly effective before the agricultural improvements of the eighteenth century. Uplands cut the area into compartments, and the lowlands themselves were broken into small units by considerable areas of forest, marsh and lake. In the absence of any large river to act as a centralising influence, and with land transport rendered difficult and expensive by the terrain, the lack of mechanical power and the primitive state of the roads, commerce developed at a number of small centres rather than in a few larger ones. Furthermore, the harbours, though numerous, were in most cases very small and incapable of expansion on any scale.

During the seventeenth century, intensive cultivation was largely confined to the coastal fringes. The interior, with its heavy, often water-logged soils, was devoted to subsistence farming with infield and outfield and considerable areas of waste. Exceptions were to be found in the Howe and Stratheden, where the favourable climate and the dry soils lying between the central marshes and the surrounding uplands supported a more productive agriculture. The major settlements here were related to the routeways which avoided, wherever possible, the low-lying areas. Falkland grew up between the Lomond

Hills and the Howe, Auchtermuchty at the foot of the Ochils and Cupar, soon to become the county town, at a point where the Eden valley narrows and bridging was comparatively easy. The distribution of the remaining burghs along the coast was remarkably uneven. The Tay coastlands had only one—Newburgh—lying on the easiest route-way across the northern hills, and thus acting as the main outlet for the agricultural produce of the Howe. The narrow northern coastal strip with its gently shelving shores of sand and rock was unsuitable for the construction of harbours, so that, apart from Ferryport (xvii), where the crossing to Angus was made, traffic was entirely concentrated on Newburgh. Despite its exposed situation on the east coast, St Andrews benefited from its ecclesiastical and educational functions as well as from its position as the only possible outlet from Stratheden. From St Andrews to Fife Ness, the coast is rocky and open to the east wind and was thus devoid of harbours, but between Fife Ness and Kinraig particularly favourable conditions supported no less than six Royal Burghs on a stretch of coast not more than fifteen miles in length. St Monance (xx) and Elie (xix), though they did not attain burghal status until much later, were scarcely less important. This remarkable concentration of settlement was based on local resources and a thriving trade with other parts of Scotland, England and continental Europe. The raised beaches and igneous outcrops afforded good soils which, together with one of the driest and warmest climates in the country, encouraged the growth of grain in quantity sufficient for export to less favoured areas. At the same time, the East Neuk uplands were used for the rearing of sheep and there was a considerable export of wool and skins to the manufacturing areas of the Low Countries. There was also an important trade in connection with the linen industry, so widespread in Eastern Scotland at this time, involving the import of flax, chiefly from the Baltic, and the export of cloth to other parts of Britain and overseas. The numerous small coal pits which worked the seams of the Lower Carboniferous, supplied fuel for salt pans, the products of which, together with some of the coal, were shipped both coastwise and abroad. Fishing, particularly for herring, was another valuable asset (Pl. 4).

Between East Wemyss and Queensferry were five more Royal Burghs, the prosperity of which was based on a similar combination of resources, with the coal, salt and linen trades providing a larger, and agriculture a smaller, proportion of the economic activity. Here, coal seams were well developed in Carboniferous Limestone and Coal Measures alike, fertile soils were available on raised beaches and in the Leven Valley, and wool-producing areas on the south-western uplands. Kirkcaldy and Dunfermline, the latter with important historical associations as a former capital, were the leading centres of the linen trade.

The first half of the seventeenth century was, in many ways, the most prosperous in the history of Fife, but about 1650 a marked decline set in, in which connection it may be noted that the link with England was by no means wholly beneficial. The Union of the Crowns was followed by a period of civil and religious strife, and the county suffered



Photo by Aerofilms

PL. 3. DUNFERMLINE FROM THE SOUTH

Carboniferous rocks here form a low plateau with a steep edge into which the Lyne Burn has cut a sharp gorge. Malcolm Canmore made this site the Scottish capital about the time of his marriage to Margaret of England (1067) and the Abbey followed in 1150. Coal occurs in the neighbourhood and Dunfermline attained distinction in the manufacture of fine linens but has now passed to a variety of more modern textiles.

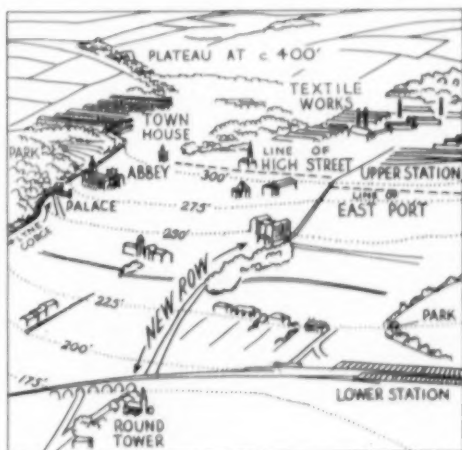




Photo by "The Scotsman"

PL. 4. CRAIL HARBOUR

One of the ancient Royal Burghs of the East Neuk of Fife, Crail formerly traded across the North Sea but is now only a picturesque little fishing town with narrow streets running steeply up the 25-foot and 50-foot raised beaches. The red pantiles and cross-stepped gables so characteristic of the east coast show the influence of the Low Countries. Creels and small boats are evidence of the modern inshore fishing.

heavy losses at the battle of Kilsyth. The Dutch wars cut off that trade with the Low Countries on which Fife was particularly dependent, and the Navigation Act of 1660 excluded Scottish traders from the English colonies. At the same time, the extinction of several of the burghal monopolies, though ultimately of benefit in allowing greater economic flexibility, added to the widespread distress. The Union of Parliaments in 1707 gave Scotland access to trade with English colonies, but this was of more benefit to the west of the country than to the east. Any additional prosperity which it may have brought to Fife was more than offset by the imposition, seven years later, of a heavy excise duty on salt, which crippled the trades in that commodity and in fish, two of the most important elements in the county economy.

Eventually, prosperity returned, but the shift of emphasis in industry and trade to the western parts of the Central Lowlands has meant that Fife's former pre-eminence has been lost. There are indications, however, that it will in part be regained in coming years.

The *Old Statistical Account*, published in the 1790's, gives a vivid picture of conditions at the end of the eighteenth century, and in many cases makes comparisons between the population as given in Dr Webster's census of 1755 and in a similar enumeration made in 1791. At the latter date, the eastern part of the county contained 48.1% of the population and the western 51.9%, giving densities of 147.9 and 209.2 per square mile, respectively (Figs. 4 and 6). These figures reflect the greater development in the west of coal-mining and linen manufacture and the importance of Kirkcaldy and Dunfermline. In the latter parish there were 624 mineworkers, producing over 90,000 tons of coal annually, and 824 weavers, while the parishes of Abbotshall, Kirkcaldy and Dysart (20) together had 650 looms.³ The east, however, was by no means devoid of industry since linen manufacture was widespread and coal was extracted from the Lower Carboniferous in areas far removed from the present mining sites. The parish of Pittenweem (59), for example, had 36 mineworkers and Kilconquhar (49) had 109. Weaving is mentioned in connection with no less than 41 of Fife's 60 parishes⁴ employing, for example, 54 hands in Crail (56) and 52 in St Andrews (47). In Kennoway (32) it was reported,⁵ "every person almost that is not engaged in the labours of the field is employed at the loom." Rural densities were higher in the east, where conditions were more favourable to agriculture, and agricultural workers formed a larger proportion of the population, but the countryside as a whole was able to support a larger number of people than would otherwise have been the case owing to the large numbers of women engaged in domestic flax-spinning. In 1793 the manufacturers of Kirkcaldy consumed 178,000 spindles of yarn to produce 20% of Fife's total output of over 5,000,000 yards of cloth,³ and it was estimated that six spinners were required to keep one weaver at work. The textile industry was thus an extremely important supplementary source of income to the inhabitants of rural areas.

Despite this, twenty-eight of the parishes showed a decrease in population between 1755 and 1791, varying from as little as 2% in Elie to as much as 57% in Beath, a trend resulting from several

important changes in the economy. In agriculture, the forty years preceding the publication of the Old Statistical Account had been a period of rapid improvement, so that "by the end of the eighteenth century almost as much land was cultivated as at the present day".⁵ Cash-cropping was extended at the expense of run-rig subsistence farming, techniques were improved and tenancies made more secure. In many parishes, the area under arable cultivation was increased and, over the county as a whole, enclosures for sheep or cattle pasture were limited in extent. Nevertheless, the new methods often reduced the numbers permanently employed on the land as farms were enlarged, and the 'cottars' who had held small plots in return for labour on the land-owner or tenant's holding were dispossessed, a fact repeatedly commented upon in the Statistical Account. At Collessie (24), the decrease of 47% was attributed to "the junction of farms and the number of cottages which have been suffered to fall into decay".³ Again, in Auchtertool, "what used to be two or three farms is thrown into one . . . the number of families decreased and with neither manufacture nor trade the population has considerably diminished."³ Particularly large decreases were recorded in cases where pasture had replaced arable land, as in Beath (57%), Ballingry (11) (52%) and Strathmiglo (16) (42%), areas obviously unsuited to commercial arable farming.

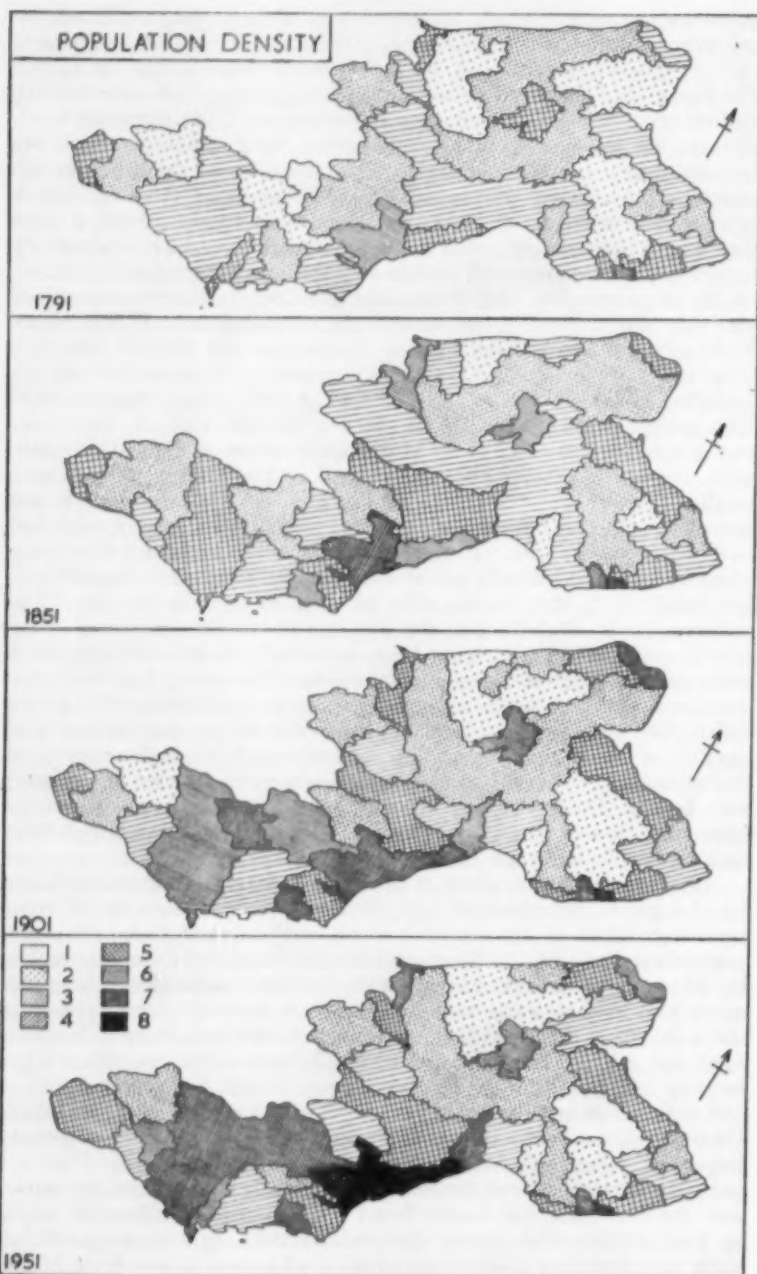
Changes were also taking place in the distribution and intensity of fishing, manufactures and trade. The second half of the eighteenth century was a period of decline for the fisheries of Scotland. Anstruther, Kilrenny, Crail and other coastal parishes recorded a reduction in numbers as the report from Crail shows. "For half a century the fisheries have been declining. . . . The natural migration of commerce from small towns to large . . . has deprived Crail of any little portion of foreign trade it formerly enjoyed", and the whole town bore "evident marks of having seen better days".³ Already the movements typical of the nineteenth century, from country to town and from east to west, were gathering momentum. The linen industry was becoming more centralised, even before extensive mechanisation. The capitalist manufacturer collected yarn from the domestic spinner, distributed it to the weaver and collected and sold the finished cloth, so that it was convenient for spinner and weaver alike to live in or near the centres of the trade, chiefly Kirkcaldy and Dunfermline, and to a lesser degree Cupar and Newburgh. Hence the population of parishes within easy reach of these centres grew, while that of more remote districts declined. A similar concentration was taking place in the case of coal-mining as many of the smaller pits in the east were closed down and newer, larger ones, were opened in the west. Thus, at the beginning of the nineteenth century, the lowest densities were to be found in the more remote areas of the east, north-east and north-west, particularly on the less productive uplands, while the highest densities were recorded in the more fertile lowlands and particularly around the growing towns (Fig. 4).

The great changes of the nineteenth century affected Scotland no less than the other countries of western Europe, and although their

influence was most strongly felt in the west of the country, Fife was by no means unaffected. Whilst the population of Scotland increased by 177% between 1801 and 1901 that of the county rose by 133%. The figure for the western section is 230% as against 35% for the eastern, and by 1901 the western had come to contain 71% of the county total. Changes for the county as a whole reflect the familiar events of the Industrial Revolution; the regional variations show the difference in economic potentials of the two sections. The economy of the eighteenth century was such as to permit a fairly even spread of population throughout the country; that of the nineteenth gave an overwhelming superiority in resources and thus in population to the west (fig. 8).

By 1850 spinning of flax had become almost entirely mechanised and was concentrated in and around the larger centres: Dunfermline, Kirkcaldy and, to a lesser extent, Newburgh and Cupar. In 1847 there were 188 flax-spinning mills in Scotland, with a total of 303,125 spindles, of which Fife accounted for 43 and 52,344 respectively.⁶ The spinning-mill eventually superseded the hand-wheel, and there was a steady drift of workers towards the towns of Fife. The mills attracted labour from outside the county, and migration, though on a smaller scale than in the western counties, was of considerable importance. At the 1861 census, over 24,000 or 16% of the total had been born outside Fife. Introduction of machinery into the weaving sector of the linen industry was less rapid, partly because of the difficulties involved in the construction of such machinery for the many different kinds of cloth, but also because of the abundance of cheap labour provided by the hand-loom weavers. As late as 1835 there were only 168 power-looms in the whole of Scotland, but from that date onwards there was a rapid increase to several thousands. In the 1860's Fife took second place only to Forfar in the mechanised production of linen, with a total of 51 factories, 74,658 spindles and 5,038 power looms.⁷ With the mechanisation of weaving the textile industry was finally divorced from agriculture and transformed from an alternative source of income for the rural population to a full-time, essentially urban occupation.

Changes in the fortunes of domestic industry were accompanied by changes in the status of agriculture. Although some of the more remote parishes of the east and north-east⁸ reached their maximum population early in the nineteenth century and were on the decline by 1850, rural populations generally showed well-marked increases up to and in some cases beyond that date, a trend which applied to the majority of those parishes whose population had declined between 1755 and 1791. The parish of Ceres (36) shows an increase from 2,352 in 1801 to 2,944 in 1841, Kemback (42—Graph. Fig. 9) from 626 to 956 and Saline from 945 to 1,792 (1851). The growth of towns stimulated the agricultural areas and rural conditions of life were greatly improved. Internal communications were still poor, but Fife was particularly well placed to move its agricultural produce by water, and the *New Statistical Account* bears witness to a considerable traffic in food, fodder and cattle, particularly from the numerous small ports and harbours of the east, which thus gained a new lease of life.



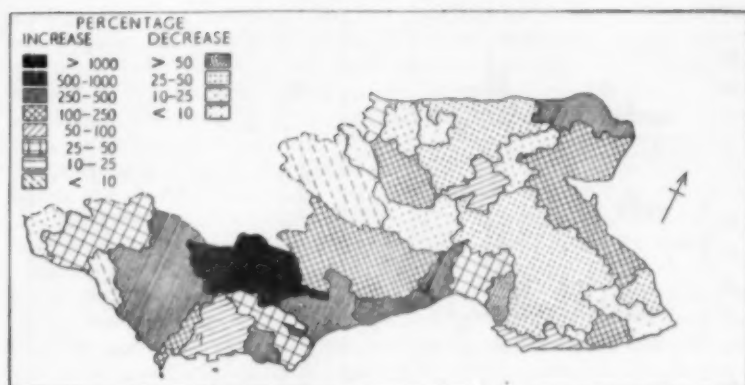


Fig. 5. Population change, 1801-1951.

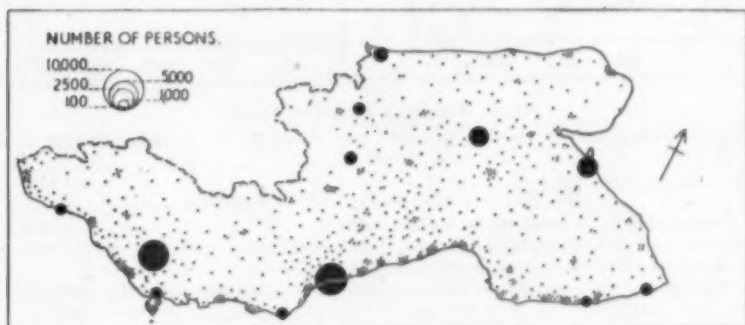


Fig. 6. Distribution of population, 1791.

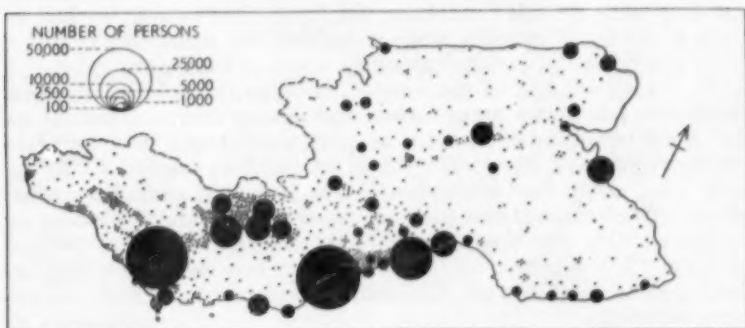


Fig. 7. Distribution of population, 1951.

Fig. 4. Fife. Population density in 1791, 1851, 1901, and 1951 respectively.
 Persons per square mile: 1. 40. 2. 40-80. 3. 80-160. 4. 160-320. 5. 320-640. 6. 640-1,280. 7. 1,280-2,560. 8. over 2,560.

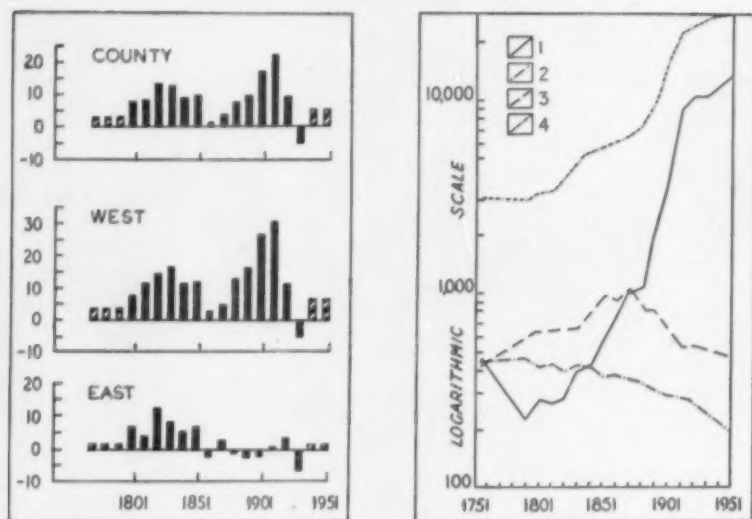


Fig. 8. Percentage change by decades.

Striped columns indicate that averages have been struck for the periods 1761-1791 and 1931-1951.

Fig. 9. Population change in selected parishes.

1. Ballingry (11). A parish on the interior coalfield.
2. Newburn (50). An eastern rural parish with limited land resources.
3. Kemback (42). A rural parish in Stratheden.
4. Wemyss (27). A parish on the coastal coalfield, with old-established trading settlements.

These shipped their produce not only to the agriculturally less favoured western parts of the county but also to more distant areas of Scotland and England. In this connection the Forth-Clyde canal, opened in 1790, is worthy of mention, since it enabled Fife cultivators to find a ready market in the rapidly expanding towns of Clydeside.

In the second half of the century, however, the picture changes. Competition from the great cotton- and woollen-textile areas put an end to the expansion of the linen industry which began to concentrate and specialise, and there was a fall in the numbers employed. At the same time, cheap food from abroad depressed local agriculture while improved techniques had already reduced the demand for labour on the land, where numbers employed fell from 14,000 in 1861 to 8,300 in 1911. The fisheries, too, remained at a low ebb, employing less than 3,000 throughout the nineteenth century and still fewer in the early twentieth.

The decline in population resulting from these factors was offset in the west, though not in the east, by a massive expansion of the coal trade. This took place here somewhat later than in other parts of Scotland, largely because of Fife's deficiency in iron ore. Although in the 1850's there were 9 blast-furnaces in operation, these did not

survive very long and there was not the stimulus to the production of coal which was elsewhere provided by an expanding metal manufacture. Thus the local demand for coal, though increasing, was somewhat limited, and Fife produced for export rather than for local industry. The earliest developments were along the coast, carrying on a medieval tradition, and by 1800 some 25,000 tons were being shipped annually from Inverkeithing, largely to the Carron ironworks across the Forth, and 6,000 tons went from Wemyss to the Low Countries.⁹ Inland, communications were still poor and the railway came rather late, so that the interior part of the coalfield remained undeveloped until the second half of the century. This point is exemplified by the parish of Beath (7) which had 613 inhabitants in 1801, and 15,812 in 1901. The demand for coal in other parts of the country and improved communications caused a rapid increase in both output and export, the former rising from 2,000,000 to 9,000,000 and the latter from 500,000 to 5,000,000 tons per annum between 1880 and 1914.¹⁰

POPULATION CHANGE 1755-1951

Details are given for the more important examples mentioned in the text.

	REF.	1755	1801	1851	1901	1951
COUNTY	—	80,520	93,743	153,546	218,840	306,855
BURGHAL	—	—	—	51,229	132,870	193,934
LANDWARD	—	—	—	102,317	85,970	112,921
EASTERN SECTION	—	41,802	46,626	66,435	62,548	63,026
WESTERN SECTION	—	38,718	47,127	87,111	156,292	243,829
BURGHES :						
Dunfermline	D	—	—	8,577	25,250	44,710
Kirkcaldy & Dysart	K	—	—	6,703	37,641	49,037
St Andrews	xviii	—	—	4,730	7,621	9,459
Cupar	xv	—	—	4,005	4,511	5,530
East Neuk†	xix-xxiii	—	—	7,621	9,256	8,489
Buckhaven-Methil	xiii	—	—	2,824*	8,828	20,154
Leven	xiv	—	—	2,083	5,577	8,868
Cowdenbeath	iii	—	—	1,148*	7,467	13,153
Lochgelly	iv	—	—	1,629*	5,472	9,102
PARISHES (Coalfield) :						
Auchterderran	12	1,143	1,045	3,210	8,626	17,599
Ballingry	11	464	277	568	4,156	13,831
Beath	7	1,099	613	1,252	15,812	22,643
Wemyss	27	3,041	3,264	5,647	15,031	28,415
PARISHES (Rural) :						
Kemback	42	420	626	956	412	464
Flisk	28	318	300	213	232	201
Saline	3	1,285	945	1,792	1,012	1,413

† Elie, St Monance, Pittenweem, Anstruther, Kilrenny, Crail.

* 1861.

The greatest nineteenth century increases were thus in the west and particularly around the larger towns. Throughout the period, Dunfermline and Kirkcaldy have been the largest centres of population. Dunfermline owes much to its early importance as a burgh, a religious centre of pre-Reformation days and, for a time, as Scottish capital. Its position as a route centre was an added advantage. Lying at the junction of routeways from south to north via Queensferry and Glenfarg to Perth and beyond, and from east to west along the northern shores of the Forth, Dunfermline was able to control an important part of the trade from which the county's early prosperity sprang and to become one of its leading manufacturing centres, a position it occupies to this day. Kirkcaldy is, perhaps, less favourably placed but has the advantage of a coastal position on the narrower, less exposed portion of the Firth and easy access to a hinterland in which water suitable for the bleaching of linen cloth was to be obtained from the Leven, the Ore and their tributaries. Furthermore, its harbour, excavated from raised beach deposits, is less restricted than those of the rocky coasts of eastern Fife. Both towns have, of course, been able to maintain their leading position by virtue of their situation within the most productive mining areas of the county. However, the expansion of the old centres with their diverse activities was accompanied by the growth of new ones, particularly on the coalfield where typical 'single-industry' towns sprang up. When burghal populations were first recorded separately from those of the parishes (Fig. 3) in 1841, the inhabitants of Dunfermline numbered 7,865 and those of Kirkcaldy and Dysart 6,670. By 1901 the corresponding figures were 25,250 and 37,641, increases of 221% and 464% respectively. Burntisland (v), where shipbuilding had become firmly established by 1901, showed an increase of 208%, but the smaller burghs, even in the west, lagged behind: Kinghorn (xii) (11%), Inverkeithing (18%). The most striking increases were recorded on the inland parts of the coalfield where settlements which were mere villages in the eighteenth century had outstripped all but the largest Royal Burghs by the end of the nineteenth. Cowdenbeath (iii), with a population of 127 in 1841, which by 1901 had 7,467, was the outstanding example. Lochgelly (iv) and Buckhaven—Methil (xiii), the port specially developed for the coal trade—were others, while similar increases also took place in settlements such as Kelty, Lochore, Glencraig and Auchterderran, which did not attain burgh status. An idea of the total increase on the interior coalfield can be gathered from the fact that the combined population of the parishes of Beath (7), Ballingry (11) and Auchterderran (12) increased by over 750% in the same sixty-year period.

Off the coalfield, as we have seen, rural depopulation was common, though it never reached the proportions typical of more remote highland areas. Nevertheless, while the total population of the eastern section remained almost stationary between 1841 and 1901, the 'landward' element decreased by 23.7%. Only a few towns grew to any great extent, and increases were well below those of the west. Cupar, market town and administrative centre of the county, increased by 26% and St Andrews by 71%. The largest rise recorded was one

of 414% for the cluster of small towns, suburban to Dundee, along the south bank of the Tay, which by 1901 had over 6,000 inhabitants. Many of the historic burghs and trading centres shrank; Auchtermuchty by 52%, Culross by 42%, Falkland 38%, Earlsferry 36%, Newburgh 24% and Crail by 11%. Changing economic patterns had passed the initiative from the older centres of the east to those of the west and to their younger rivals, as well as from countryside to town. In 1861, 22.4% of the working population had been employed in agriculture and only 12.1% in mining. In 1911, 26.8% were employed in mining, 18.2% in manufacturing, 27% in transport, commerce and service industries, and only 7% in agriculture and 1.7% in fisheries.

The first half of the twentieth century has seen a continuation of the trends of the preceding fifty years: a decline in the relative importance of the textile industry, concentration on the coalfields, the stagnation or decline of eastern rural areas and an atrophy of the older ports of the East Neuk. The next few decades are likely to witness an intensification of these trends. Since 1901, the county population has risen steadily, apart from a temporary decline during the depression period, and in 1951 stood at 88,000 or 40% above the 1901 figure. Practically the whole of this increase (87,000) has occurred in the west which has gained 56% as against 0.8% in the east. Kirkcaldy (49,037) and Dunfermline (44,710) between them contain 26% of the total and the west as a whole nearly 80%. The new towns have continued to grow rapidly: Cowdenbeath by 76%, Lochgelly by 66% and Buckhaven—Methil by 152%. The three parishes of the inland coalfield¹¹ have increased their population by 88% to over 54,000 and the mining centres of Kelty, Cardenden, Lochore and Glenraig each have more than 5,000 inhabitants.

Rural populations away from the coalfield continue to diminish and no less than 28 parishes show a reduction from their 1901 figures. Decline has taken place not only in predominantly rural areas, but also in the coastal burghs where the growth of the tourist trade was not sufficient to offset the decline in fishing and commerce. Anstruther, Kilrenny and Pittenweem were particularly badly affected. The concentration of trade on larger ports killed the commerce of the old burghs even in western areas. Dysart harbour, thriving in 1900, now appears derelict.

Thus the present distribution of population (Fig. 7) is markedly uneven. In the east the average density is 214 per sq. mile, which, if the burghal populations are extracted, falls to 94, whereas in the west the overall figure is 1,167 per sq. mile and the 'landward', 441.

In rural areas, the typical unit of settlement is the isolated farm with its farm-house, farm-buildings and workers' cottages. In the more intensively cultivated lowlands of the Eden Valley and the lower parts of the East Neuk, the number of persons per unit varies between 15 and 30. On the smaller stock-arable farms of the uplands, the number falls to 8 to 15.¹² Large villages are found only where some local industry exists, such as paper-making or distilling.

On the coalfield, in addition to the larger centres already

mentioned, there is a considerable urban sprawl which occurs in two distinct zones, each with over 100,000 inhabitants. The first stretches inland and eastward from the coast near the Forth Bridge to include Dunfermline, Lochgelly, Kelty, Cardenden, Lochore and intervening mining villages; the second lies along the coast from Kirkcaldy to Leven, embracing Dysart, East and West Wemyss, Buckhaven and Methil, and extending up the valleys of the Ore and Leven to Thornton, Markinch and Kennoway.

In the current plans of the National Coal Board, the Fife coalfield is scheduled for a greatly increased output, to be won primarily from the south-eastern part of the field in the Ore valley, but also from the west between Dunfermline and Culross. Nearly 75,000 people are to be 'attracted' from the declining Lanarkshire field, 45,000 to the first of the areas mentioned and 28,000 to the second. Kennoway is to be developed for a population of 10,000 and the new town of Glenrothes, between Thornton and Kirkcaldy, had 5,000 of its scheduled 32,000 inhabitants by the end of 1953.

These movements will increase still further the predominance of the western section over the eastern. At the same time, the county as a whole will become still more important in the Scottish economy and is likely to contain a larger proportion of the population of Scotland than at any time since the seventeenth century.

¹ 1938: Arable, 39%; rotation grass, 20%; permanent pasture, 30%; rough grazing, 10%.

² Strictly speaking, the division is between north-east and south-west, but the terms 'east' and 'west' are used for clarity of expression. For statistical purposes, a convenient administrative boundary has been taken: that between the districts of Dunfermline, Kirkcaldy, Lochgelly, Wemyss (West) and Anstruther, Cupar, St Andrews (East). Cf. map of Administrative Divisions, Fig. 2. All the modern coal-producing areas are to the west of this line, and all the land classified by the Land Utilisation Survey as 'First Class' lies to the east.

³ *Old Statistical Account, Passim.*

⁴ TURNER, W. H. K. Some Eighteenth-Century Developments in the Textile Region of East Central Scotland. *S.G.M.*, 1953, 69(1): Map (p. 16).

⁵ O'DELL, A. C., and SNODGRASS, C. P. Fife. p. 658. *The Land of Britain*, Part 30, 1946.

⁶ HAMILTON, H. *The Industrial Revolution in Scotland*. Oxford, 1932. p. 111.

⁷ — *Op. cit.*, p. 117.

⁸ E.g., Flisk (28), Kilmany (39), Balmerino (38), Kingsbarns (55), Newburn (50). See Fig. 5.

⁹ HAMILTON, H. *Op. cit.* p. 170.

¹⁰ SMITH, A. The County of Fife. *The Third Statistical Account of Scotland*. Edinburgh: Oliver and Boyd Ltd, 1932.

¹¹ Beath, Ballingry, Auchterderran.

¹² SNODGRASS, C. P. Section on Population, in: *Scientific Survey of South-Eastern Scotland*. Edinburgh: Published for the British Association by the Local Executive Committee, 1951. p. 136 *et seq.*

URBAN GRADES AND SPHERES OF INFLUENCE IN SOUTH WEST WALES : AN HISTORICAL CONSIDERATION

HAROLD CARTER

THE regional sub-division of the earth's surface has tended to show two main emphases.¹ The first of these can be called the sub-division into 'formal' regions in which the actual physical appearance of the land surface is the element which gives unity, while the second can be called the division into functional regions where unity is given by sets of human associations rather than by any physical or material features. The major factor which gives unity to functional regions has in many cases been taken as the town which centres on itself the life of the surrounding countryside.² The degree to which a town is significant in this sense can be recognised by the presence of those functions which are specifically related to regional services. This can, to some degree, be objectively measured by a count or analysis of these functions from which, in turn, a hierarchy of towns can be constructed.³ Likewise the area over which the influence of the town extends can be measured and a variety of methods have been developed for this purpose.⁴

The interpretation of this material in relation to the needs of the geographer seems not, however, to be fully developed. Most analyses touch lightly upon the factors which have created present schemes, though it would seem that the increase in depth of background gained by historical consideration would enhance the usefulness of this material to the regional geographer. It is, of course, a point of debate whether the geographer has any interest at all in the past, but it appears that most British geographers would accept the fact that regional study must take cognisance of those factors which have, by their operation in the past, materially affected the present. Such factors are always taken into account when urban morphology is under consideration, and the growth plan is a standard feature of morphological studies. It is contended that equivalent studies of the historical development of the urban hierarchy and urban spheres of influence in a given area would add a great deal to the general understanding of the present. Indeed, the interpretation of modern functional studies inevitably involves a consideration of the past, and hence the formal adoption of such an approach may be preferable to continued reference back to, and explanation of forces active in, the past.

The present pattern of urban grades and spheres of influence in South West Wales is summarised in Figure 1. The grading of towns here adopted is a simple assessment based on selected data and with emphasis on the commercial function. The towns of the area, with one exception, are essentially market centres for the surrounding countryside in which agriculture is economically dominant. They act as focal points for exchange and general business transactions. Thus, the presence of banks is a feature of great importance especially

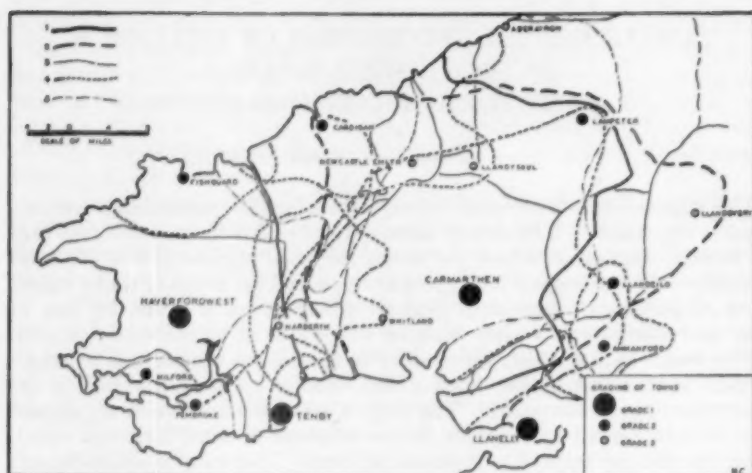


Fig. 1. South West Wales: Urban grades and selected spheres of influence.
 1. Area boundaries of a wholesale company. 2. District boundaries of an insurance company. 3. Urban hinterlands as determined by bus routes (F. H. W. Green, *Geographical Journal*, 1950). 4. Newspaper reporting areas. 5. Head Post Office areas.

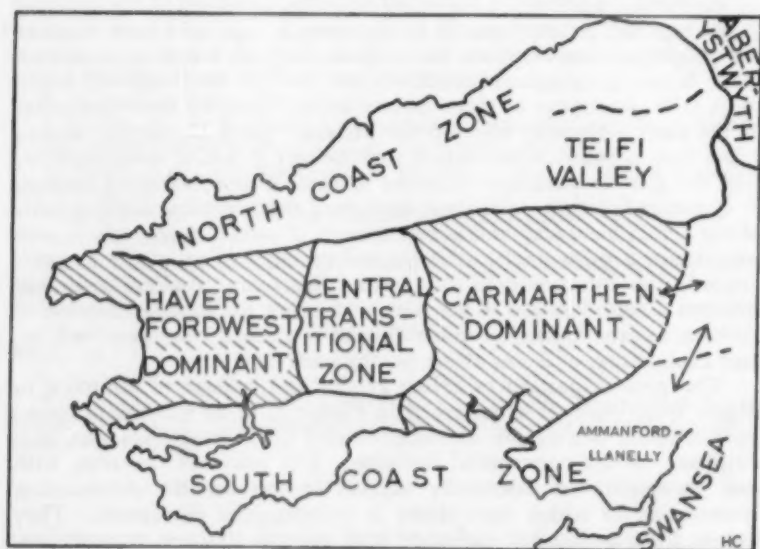


Fig. 1a. Generalised interpretation of Fig. 1.

in an area where milk production means payment for the farmer by cheque from the Milk Marketing Board and a weekly visit to the appropriate bank in the market town is the standard procedure. But the colonisation of Wales by one of the 'Big Five Banks' is not even or complete, and hence four are taken as a criterion for the first grade of town. Likewise in the commercial sphere, the weekly visit of the farmer to town for business purposes is paralleled by a visit by his wife for shopping purposes. Chain and department stores have long been used as criteria for the measurement of the importance of a town in this respect.⁵ They present their goods openly to the customer, a variety of articles brought together in one spot, thus in one sense they are the linear descendants of the old street booths of market-day, and in another, the supreme example of the village shop in an advanced and urban setting. A range of such stores—including Woolworth's—was therefore selected as a second criterion. Lastly, the centralisation of business and administration in a town is reflected by the volume of mail that it gives rise to and, therefore, in the status of the Post Office. Moreover, this not only provides a specific criterion but also a general one in that it has been stated that "the correspondence between places we have been led to consider as towns, and those whose post-offices rank as Head Offices is so remarkably close as to suggest that here is, perhaps, the most satisfactory rough single criterion for recognising town status".⁶ Here it must be emphasised that this grading is only comparative and not absolute, that is, while giving a ready means of comparing broadly the ranking of these towns in the urban hierarchy, it does not claim that each grade has absolute significance within the hierarchy as fully-fledged town, sub-town, etc.

- Grade 1* : Four out of Big Five Banks.
Complete range of selected Chain Stores.
Head Post Office.
- Grade 2* : Three or more of the Big Five Banks.
Part of range of Chain Stores.
- Grade 3* : Three out of Big Five Banks.

The spheres of influence are defined by criteria which are generally accepted. The general fields, as suggested by Green from 'bus route analysis, are superimposed on more specific fields related to commercial factors (wholesale distribution) and also to factors of social cohesion (local newspaper areas). No attempt has been made to resolve these into a composite field since it is felt that such generalisation, while convenient, destroys the actual complexity and presents a mathematical abstraction in place of reality. Each function is quite clearly exercised by the town over a different area. But in order to aid interpretation, a diagrammatic summary has been made (Fig. 1a).

In terms of relief, South West Wales consists of a highland core, the Preseli Mountains, rising to a height of over 1,700 feet, surrounded by a series of lower plateau surfaces. The dominant levels appear to be at 200, 400 and 600 feet. The 600-foot surface differs from the lower two in that it appears to be due to sub-aerial erosion.⁷ Consequently

the marine-cut lower surfaces can be grouped together as the coastal plateau, a feature which is terminated by a cliffed and indented coast. This coastal plateau is much more extensive⁸ to the south than to the north where it is narrower and far less significant (cf. Fig. 2).

With all these features in mind, an examination can now be made of Figures 1 and 1a.

I

The overall dominance of two towns, Carmarthen and Haverfordwest, is marked. These two towns are centrally situated within the peninsula and are the foci on which the whole pattern is based. The areas of immediate dominance are restricted to the low coastal plateau south of the Preseli Mountains, but for more 'metropolitan' functions their influence oversteps this physical barrier and includes the areas of the coastal plateau to the north. The fields of these towns therefore break down into two parts: the first, a smaller more completely dominated area south of the mountain core, and the second, a larger, more loosely related area which includes the whole of the peninsula. By statistical analysis H. E. Bracey has suggested the existence of three zones of dominance around urban centres.⁸ These he has called the intensive area, the extensive area and the fringe area. If these terms can be loosely applied to the case under consideration, then it would appear that the two parts identified would correspond to the extensive and fringe areas. The intensive area is not represented, though the selection of further criteria would reveal this at the expense of adding to the complexity of the map.

The areas outside the immediate dominance of these two towns fall into three zones where other centres exert considerable local influence, overlapping and ousting the dominance of these twin controlling centres.

- (a) There is a clearly marked transitional zone between the two major towns. Within this, Narberth, has apparently been able to grow in functional importance as has also Whitland.
- (b) There is a southern zone based on a series of towns high in the urban hierarchy by virtue of the functional institutions they possess, but with urban fields that are markedly restricted and which do not, to any degree, extend northward across the low coastal plateau.
- (c) There is a northern zone, again elongated but better developed, coincident with the coastal plateau to the north. There is a two-fold system of repetition of urban functions within this zone by towns low in the hierarchy, first along the coast within coastal embayments, and second along the Teifi valley.

Lastly, this series of associations gives way eastward and northward to the field of Aberystwyth, a centre equal in status to Carmarthen, and in the south to the industrial complex based on Llanelli and Ammanford, and ultimately Swansea.

It would seem that such an interpretation, while satisfactory to the planner, fails to satisfy the academic geographer. In the first place

it is solely descriptive and makes no attempt to assess cause, in fact it does not interpret but only delineates the areas. Likewise it does not explain the location of these urban centres but only describes their present relative significance. It would seem that there is a great danger of description being regarded as explanation and of the geographer leaving off at the very point where the major part of his work should begin.

It becomes apparent therefore that explanation of these features must take account of the processes which have created them working in relation to the physique of the peninsula. The first question is that of origins and these must be traced back to the Norman Conquest. "There are no towns of purely Welsh origin . . . the making of boroughs in Wales originated with the Norman or English Conquest about 1080. Up to that time the native economy scarcely required real urban centres."⁹ This needs slight modification in the light of recent work¹⁰ in that the Welsh princes imitated Norman custom giving charters to small native settlements where commerce was growing, but this does not impair the reality of town creation as against town growth. The town therefore was established by the Normans as an instrument of military conquest and it did not grow out of local needs; there is no question of town growth as a response to the commercial demands of a hinterland. Location must therefore be analysed in terms of the reaction between a military conquest and the nature of the terrain over which it was moving. Thus considered, three factors in the nature of the conquest were important in relation to the foundation of towns and it must be noted that generally the town was but a secondary adjunct to the castle; Sir Cyril Fox has even called it merely the outer ward of the castle.¹¹

The first of these factors was strategic. The Norman invasion was but one of a long series of invasions spreading from lowland England into and along the lowland margins of Wales. It was partly linked to sea control and by the whole nature of its military machine, was essentially lowland and coastal. The defence and holding of these coastal areas was therefore the vital factor in the general location of the castle towns and a determinant of position. The second factor was economic. Norman economic exploitation was based on the introduction of the manorial system and its arable agriculture. Limitation to the coast plateau was thus emphasised in an area where such a system was at its western limits and virtually in a marginal area. "Strategic geography", wrote Mackinder, "deals with larger topographic conditions of offence and defence. Economic geography is concerned with the production and distribution of commodities. But the problems to be solved are closely inter-related, for defence is essentially the protection of the means of economic existence."¹² Manor exploited and castle defended these coastal areas and the whole system was pivoted on the major strong points, the towns. The third and last factor was tactical. Within a general area determined by broad strategic needs, local tactical advantages were paramount in the choice of site for the castle town. The major factors were height, both for observation and the psychological suggestion of dominance, slope, and water protection.



Fig. 2. Boroughs of South West Wales in the 14th century.

These are the factors which are at the root of the distribution of Medieval Boroughs (Fig. 2). The actual definition of a borough, a legal as opposed to a functional concept, is extremely difficult and a wide variety of settlements have been included under this general heading. These range from a few houses grouped around a castle and granted the right to hold a market, to a walled town possessed of a royal charter of incorporation. The legal definition is in reality of no interest except in so far as it gave added initial significance to these settlement points and reflects the concept of the whole pattern as one created and not developed. The classification adopted in Figure 2 gives some indication of the relative importance of these points in the 14th century.¹³ The coast plateau both to north and south was firmly held by a chain of boroughs and castles, a chain which in Pembrokeshire was so obvious as to become defined in a single line known as the 'landsker'. This line extended along the major valleys where lowland tongues penetrated the inner upland areas. The coastline, and especially the major indentations of Milford Haven and Carmarthen Bay, were securely held by a series of towns.

Nearly all these towns have site features in common. Pembroke is characteristic. In the initial phase of the conquest Roger de Montgomery required a base for operations north of the Teifi and finding Cardigan too exposed sent his son Arnulph south by sea. Arnulph sailed around the coast of the peninsula and up Milford Haven, and finding an ideal site, built the first castle at Pembroke. A steep bluff of limestone rises sharply above two small 'pills' which join the rise of Milford Haven (Fig. 3a). This elongated ridge was only open to the east where an artificial trench could easily be constructed. Later, with the Irish conquest, Pembroke became an important base and, according to Giraldus Cambrensis, the Metropolis of Demetia.¹⁴

It was in this general manner that the foundations of the urban pattern were laid. Quite clearly the process was more intricate than is here suggested. Thus, for example, Carmarthen grew at a position of great significance where two routes to the west join, that via the

Fig. 3a. The site of Pembroke.

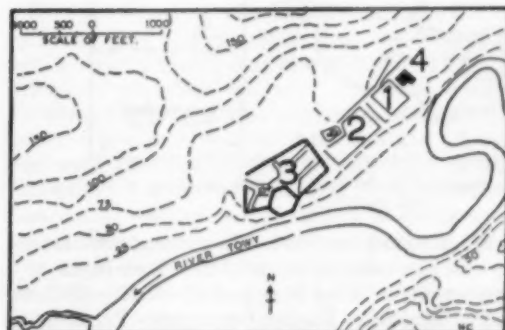
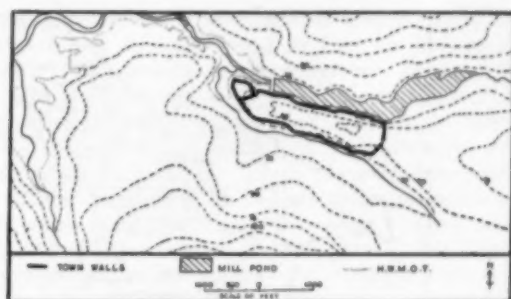


Fig. 3b.

The site of Carmarthen.

1. Roman fort Maridunum.
2. Old Carmarthen.
3. Norman Borough :
New Carmarthen.
4. Church of St. Teulyddog
(after E. G. Bowen).

Usk and Towy valleys and that via the South Wales coastal plain. Its site was on a terrace of glacial gravels cluffed by the meandering River Towy. On the edge of the terrace, taking full advantage of the relative height, slope and the water protection afforded by the river, the Norman castle was built circa A.D. 1093 (Fig. 3b). But Carmarthen already had a long history of settlement.¹⁶ Immediately adjacent had been the Roman fort of Maridunum established by a previous military conquest in the same general position and nearly on the same site. In the Dark Ages, St Teulyddog had established his monastic settlement in close relation to the fort. Thus there had existed settlements prior to the Norman penetration which cannot be called urban in any sense, but it was alongside them that the Norman town of 'New' Carmarthen was established. In short, the plantation of the boroughs cannot always be clearly dissociated from existing settlement, and the consideration of pre-urban nuclei becomes as important in this sense as in considerations of morphology. In all probability there was an attempt to utilise whatever importance existing settlements possessed. But with that fact understood, the Norman period saw the creation of these urban embryos, as they might be called. Some grew, while others failed to develop. The initial pattern has thus been modified and changed, but it has never been erased and re-created. The present pattern must be conceived as growing out of this initial structure.

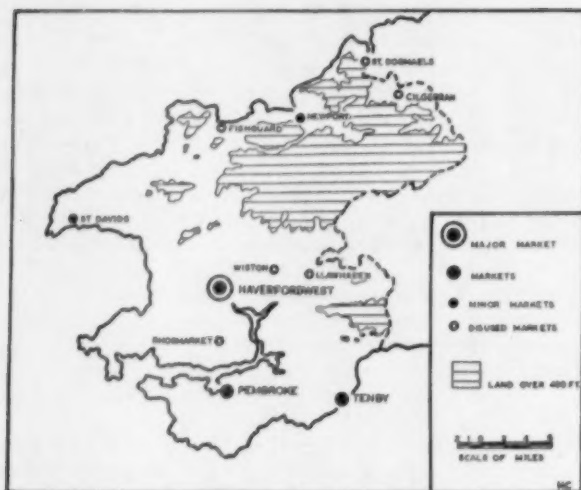


Fig. 4. The market towns of Pembrokeshire at the beginning of the 17th century.

The starting point is not the demand created by the present population, but the developing story of a pre-existing mesh of urban embryos.

The first modification extends over the long period which politically culminated in the Act of Union with England in 1536. Pacification meant a vital, if gradual, change in town function. No longer was the town required as the strong point of a military occupation, since superficially the Norman aims of conquest, acculturation and assimilation had been achieved. But with progressive pacification came increased economic activity which the Normans themselves had forcibly and deliberately concentrated in the towns. The town thus in fact became the focus for a surrounding tributary area and the nature of that area reacted greatly on town growth or decline.

It is difficult to show how this process worked, but fortunately in George Owen's *Description of Pembrokeshire* published in 1603,¹⁶ sufficient detail exists to examine developments in that county (See Fig. 4). Owen writes: "There are three market towns in Pembrokeshire, viz., Pembroke, Haverfordwest and Tenby. The second whereof being seated in the midst of the shire and most convenient for trade is greatly frequented by the country people and therefore is the plentifullest market of the shire."¹⁷ Thus, pure centrality within the county and peninsula is stressed. The market, and following on the concentration of economic activity, the town, had become much more important than the county town of Pembroke which four centuries before Gerald had described as the 'Metropolis of Demetia'. This may in part have been due to administrative reorganisation of the Act of Union which greatly enlarged the county and made Haverfordwest geographically central within it, but this would never account for the flourishing of the market. Owen continued, "This market at

Haverfordwest is thought to be one of the greatest and plentifullest markets within the Marches of Wales¹⁸ and he lists the variety of produce appearing there. This emphasises two factors. In the first place, a tributary area which was economically productive was essential to town growth. The exchange so stimulated was centred in the town and basic to its development. Secondly, and of equal importance, was the variety of goods entering the market. Thus, Haverfordwest was an intermediary between the Anglicised arable agriculture of the coast plateau and the Welsh pastoralism of the interior. This was not true of Pembroke or Tenby with which Owen dealt next (Fig. 4). "These two towns for their markets are much inferior for plenty of victuals and corn to that of Haverfordwest by reason these towns are seated the one in the lower parts of the shire and much hindered by reason of a ferry on one side, and Tenby seemeth as it were a town running out of the country and stayed on the sea cliff, by reason whereof they stand not so commodious for resort of people which makes less trade and utterance on their markets".¹⁹ This really needs no comment; Pembroke was in military terms a magnificent site and a good base, but as a market it was eccentric and cut off by Milford Haven. Likewise with Tenby, siting factors, especially the marked advantages to the Normans of a coastal location, had effectively removed it from a position in which it could inherit a function as a major market town. Lastly Owen notes two minor markets at St Davids and Newport. The coast plateau in the north of the county is much narrower and tends to consist of a series of small embayments separated by higher ground. A narrow strip could not be effectively served by one centre but neither could these minor areas provide the basis for full town growth. The character of this area therefore tended to encourage the emergence of a number of lesser centres with restricted hinterlands. The major exception was Cardigan, to which the Vale of Teifi was tributary but which lay outside the area considered by Owen. Those points at which markets had completely vanished also need comment. Llawhaden, Rhosmarket and Wiston were all too close to Haverfordwest and were choked by its growth. Just as in the north-west of the county St Dogmaels and Cilgerran declined before the growth of Cardigan.



Fig. 5. Lordships of South Carmarthenshire in the 14th century (after W. Rees).

An equivalent process can be traced in Carmarthenshire. Here can clearly be seen the conflict between a pattern created by Norman power and the subsequent needs of a pacified countryside. Under Norman Rule each borough was the head of a lordship for which it functioned as an administrative and market centre. The lordship thus virtually gives an impression of urban fields under Norman rule (Fig. 5). The conditions controlling that system were the exigencies of castle siting. Consequently in South Carmarthenshire the central points, as has been indicated, formed a festoon around the Towy estuary. Each clung to the coast since sea connection was so vitally important. The lordships, the tributary areas, extended fanwise back on to the coastal plateau (Fig. 5). But this pattern had no relevance when conditions changed, military needs lapsed and for the piecemeal occupation of Norman lords was substituted control by a uniform authority. Thus as the county town grew and expanded its control, so the minor boroughs around Carmarthen Bay declined and were eliminated.²⁰

The process has thus been established and the subsequent story is an elaboration of this theme related to changes in ease of transport, an increasing population density and a growing complexity in the economy. These factors were not always working toward the same end. Thus improved transport would favour the emergence of a few large 'metropolitan' centres, while the increasing density of population would tend to produce a greater localised demand and the growth of small centres. The balance of all these factors seems to have been achieved by the end of the 18th century and the beginning of the 19th, a phase of equilibrium before the Industrial Revolution brought a whole new series of associations into being. By this period the weekly market had given way to a permanent shopping centre accompanied by an increasing specialisation in retailing.²¹ The beginnings of banking proper reflected these features.

An attempt can be made to construct a grading of towns for 1835 similar to that made for the present day and again emphasising the commercial function.

- Grade 1.* Market Towns that were Poor Law Union Heads.
One or more Banks.
Over 50 Grocers, Butchers and Shopkeepers.²²
- Grade 2.* Market Towns that were Poor Law Union Heads but did not fulfil the conditions of Grade 1 towns, but had at least 25 Grocers, Butchers and Shopkeepers.
- Grade 3.* Market Towns that were Poor Law Union Heads.

The emphasis on the Poor Law Unions is related to the criteria by which the heads were selected. The commissioners stated, "The most convenient limit of Unions we have found has been that of a circle taking a market town as a centre and comprehending those surrounding parishes whose inhabitants are accustomed to resort to the same market."²³ This gives some indication therefore of spheres of influence in 1835. From the map (Fig. 6) thus constructed the following facts can be noted :—

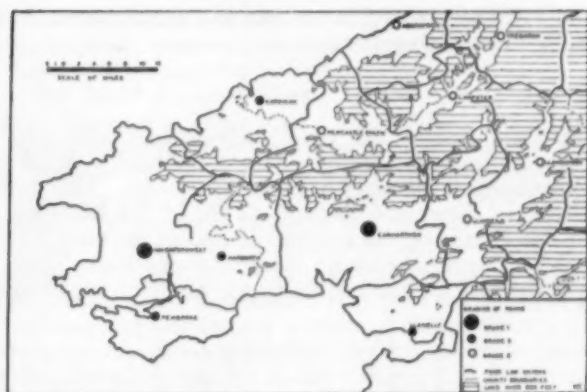


Fig. 6. Market towns of South West Wales circa 1835.

1. The dominance of Haverfordwest and Carmarthen was clearly a feature well established by this period. It had been accompanied by the elimination of all the boroughs on Carmarthen Bay. The influence of these two towns spread well beyond the area that the unions suggest. Figure 7, which shows the journeys of carriers to markets constructed from contemporary directories, emphasises that these towns were essentially 'metropolitan' having an influence over and above their more intensely dominated local hinterlands. The extensive and fringe areas were already in existence. In Lewis's *Topographical Dictionary* of 1833 it was noted that "with Bristol by Sea Carmarthen carries on a very extensive trade obtaining from it large quantities of goods of various descriptions with which it furnishes an extensive and populous district entirely dependent on it for supplies".²⁴ The 'Bristol Trade' was equally important at Haverfordwest.²⁵ Both these towns were thus important communication centres in relation

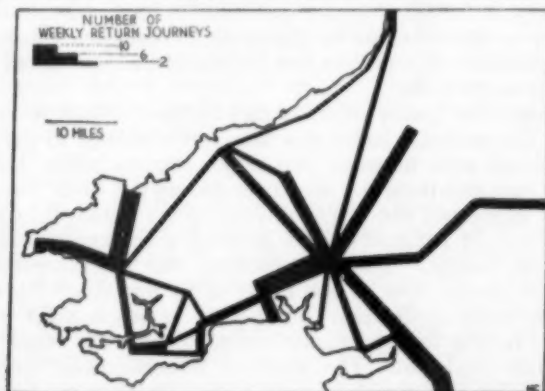


Fig. 7. Regular journeys of carriers to markets, 1830. A tentative map constructed from data in Pigot and Co. *National and Commercial Directory*, 1829-1830.

to land and sea routes, they had become true nodal points in terms of human and commercial movement.

II

It is apparent that by this time Narberth had achieved a minor status within the transitional area which would tend to develop at the limit of the spheres of influence of two major towns. This process has been outlined in theoretical terms.²⁶ Thus in the following graphs (Fig. 8) A and B are two old regional centres of the same importance and influence as service points for the intervening countryside. Their influence is denoted by the curves which intersect at the mid point

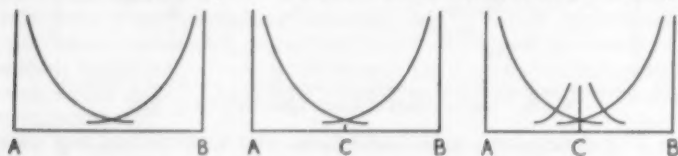


Fig. 8. Efficiency of service and town growth. (Generalised from S. Godlund.)

between them. At this point service efficiency is at a minimum and consequently small settlements within this boundary zone will develop into subsidiary centres (e.g. C). Given the necessary possibilities this sub-centre will tend to develop into a regional centre, a series of subdivisions taking place until the area is effectively served by the urban foci. This, be it noted, is a study of historical development.

The example of Narberth, however, is not as simple, because whereas increased population and a more complex and less isolated economy would make toward sub-division, increasing transport efficiency (see Fig. 7) would work in the opposite direction. There is thus a corollary to the growth of Narberth, namely the decline of Tenby. It has already been pointed out that the commercial disadvantages of Tenby's position and site had led to a relative decline in importance; this would now appear to have reached its climax in the complete decline of the town. Fortunately this process can be traced in some detail and the digression is worthwhile.

The reasons for Tenby's decline and Narberth's growth have been sketched. The essential factor was that Narberth was in the heart of the transitional area between two major centres while Tenby was completely removed from it. Moreover during the Civil War, Tenby, which had supported the King, suffered great damage. On top of this, one Captain Richard Castle granted a market to Narberth,²⁷ then a small village. Once established, this market grew to the detriment of Tenby now at the nadir of its fortunes. Therefore in 1671 Tenby made application to the King to suppress the market at Narberth. It was an application supported by the other borough towns against Narberth. The town of Haverfordwest 'prayed' to the King. "But that now by reason some persons in the late times of usurpation have erected a Market in a little village called Narberth, more in the inland, and have since for their private benefit, endeavoured

to continue the same, Your Majesties sayd Port and Towne of Tenby is very near already come to utter Ruine and desolation ; theire houses fallen down ; The peere for preserving shiping in danger to fall in decay. Yo' Ma^{ties} Revenue like to be lost, Noe seamen there for You Ma^{ties} service like to be bred. The adjacent country will ly in much danger for want of defence from pirattes ; unless yo'r Majesty shall be graciously pleased to take it into yo'r princely consideration to suppress the sayd Market of Narberth."²⁸ The market *was* suppressed since "if permitted to passe will tend to ye utter ruine and impoverishment of the Saide Towne" (Tenby).²⁹ Here then, one is able to isolate the very few years that saw this transference of urban function. But in origin Narberth was part of the Norman pattern, a small settlement grown around a castle. This is therefore a case of the variation on an original established pattern played out as geographic values changed with changes in the cultural and technical bases of society. Thus again by 1835 Tenby³⁰ was undergoing resuscitation as a seaside resort, capitalising its site and position in a different way in relation to new demands from the community. Its present grade is thus related not to function as a regional centre but to its significance as a resort town.

III

There were also growing along the south coast other towns where regional service was of no importance. Llanelly, an old nucleus, had always been the minor focus of a small area in South Carmarthenshire shut off from the spread of Carmarthen's sphere by a series of ridges orientated north-east to south-west (Fig. 6). These are Mynydd y Garreg, Mynydd Llangydeyrn, Mynydd Pembrey and Mynydd Sylen. Its emergence as a major centre was related to the second important phase of urban genesis in Wales, the Industrial Revolution. The range of urban institutions found in Llanelly is therefore in great part related to what Smailes has termed 'point production'.³¹

Milford and Pembroke Dock had been founded in attempts to capitalise the natural advantages of Milford Haven. Their story is unique and full of interest but it suffices to say here that their 'hinterlands' were of the sea, they failed entirely to develop local hinterlands and remained almost completely divorced from the life of the country in which they were situated.

IV

Along the north coast of the peninsula there again appeared the series of minor centres of which Cardigan was the most significant. This area thus tended to form a semi-independent zone lacking sufficient economic development to promote the growth of truly 'fully-fledged' towns. This is a problem widespread in Wales. The dominant pattern of small areas of good land and large areas of relatively barren ground means that no one service centre can be effective over a large area, while the growth is encouraged of a multiplicity of minor centres lacking the local basis to become fully-fledged towns. There is thus a new comer to this series, Aberaeron. "Aber-

aeron is indebted for its origin to the late Rev. Alban Thomas Jones Gwynne . . . who in 1807 obtained an Act of Parliament under the authority of which he built two piers at the mouth of the River Aeron, with convenient wharfs, cranes and storehouses".²² So wrote Lewis in the *Topographical Dictionary* of 1833 and he noted that "the principal articles of import . . . are grocery and timber". Thus this small coastal area, by virtue of distance extremely poorly served by the larger towns, successfully maintained this settlement as a minor servicing point. . . . "It is intended to start a weekly market for provisions."

The contrast between north and south is thus complete. In the south the very easy way in which Carmarthen and Haverfordwest can maintain their influence has effectively prevented a series of towns, with quite substantial aggregates of urban institutions, from creating and extending hinterlands or spheres of their own. These towns remain cut off abruptly from the country behind them. In the north, remoteness from the two major regional centres, together with the relief barrier of the Preseli, resulted in the development of the series of minor centres already examined.

It is clear from this that the position has now been reached where a comprehensive analysis can be made of the three transitional areas already dealt with in the first part of this paper. The next step would be the analysis of the present situation. It will be seen that the three zones of transition are very different in character and that these differences are very important to the *regional* geographer who is making an analysis of the peninsula.

But it is not only in the close association of a study such as this with regional geography itself that the need for historical considerations enters. In the more direct interest of urban geography itself it will be seen that the actual alignment of the urban fields is in great part dependent on the mesh created by a completely different culture at a different period. Merely to outline these fields is to leave much to be explained and appreciated. Likewise the attempt to analyse the real character of any settlement by means of its modern institutions alone is not enough. Narberth presents a convenient example (Fig. 9). It is a 'town' with three banks but with none of the accompaniments in the way of chain and department stores that characterise the so-called full-fledged town. Yet a local newspaper is published there and it has a Grammar School. It has no cinema, yet it has a well-defined area that is tributary to it in terms of postal and banking facilities. The designation 'sub-town' covers this conveniently, but hardly accurately. The real position would seem to be that, as has already been shown, Narberth developed in the early 19th century as a market centre, but as transport facilities increased, so its significance as a market town receded before the established regional centres and the growing industrial and resort towns. But concurrently with this, the gradual establishment in the countryside of an ever thickening web of social and administrative services meant that essentially urban institutions were, for convenience, planted in such existing centres as Narberth, a fact which would be even more significant in a town

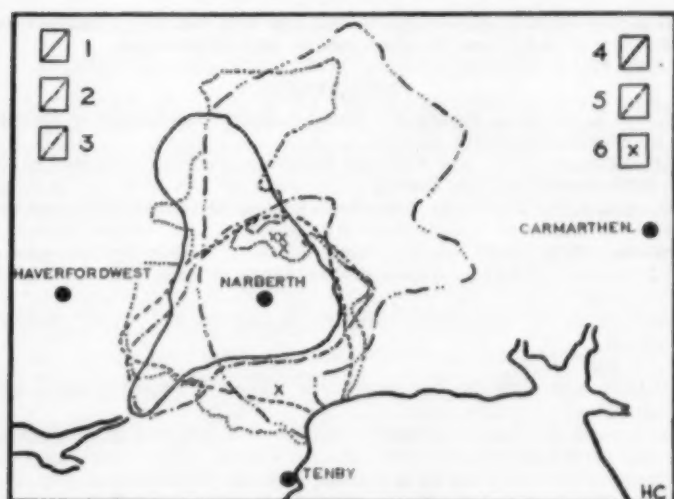


Fig. 9. Narberth: Some spheres of influence.

1. Narberth Rural District. 2. Area covered by reports in local newspapers. 3. National Farmers' Union branch area. 4. Grammar School area. 5. Postal District. 6. Sub-branches of Narberth banks.

situated virtually on the county boundary, a point where administrative functions based on the county area would be at an extreme minimum of efficiency and therefore in need of repetition. This clearly explains the presence of socio-administrative institutions (e.g. the grammar school) alongside the marked absence of commercial institutions (cinema and chain stores). This picture emerging from the historical analysis is not contained in the overall designation 'sub-town'.

An attempt has been made to present in outline a picture of the way in which the urban hierarchy and urban fields have developed in South West Wales. It is agreed that towns rise and fall in the urban hierarchy and there is thus implied a continuously changing reaction between the needs of a tributary field and the town which serves it, or between town and town in terms of competition. To put this in another way, there is a change in the values of physical situation in relation to particular functions. There is thus a process of change constantly in operation from which the study of the present cuts the thinnest top section. It is contended that here, as in all geographic studies, the interpretation of the present is deepened by examination of the past, by the attempt to understand the process as well as any single stage. "Geographers are seeking accordant relationships, and, having discovered them, to demonstrate the causal connections through the study of the processes involved. Simply to define and map a system of regions without investigation of underlying processes operating through time, and without showing clearly the relevance of the regional system to the underlying purpose, come perilously close to what Kimble calls 'doodling'. The regional concept . . . involves the time perspective as an integral part".³³

The author wishes to acknowledge the financial help that he has received from the University of Wales Press Board towards the cost of illustrations.

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WANLOCKHEAD—THE HIGHEST VILLAGE IN SCOTLAND

Until recently the future of this Dumfriesshire village hung in the balance. Quite apart from its claim to the above title, Wanlockhead was at the turn of the present century, a prosperous mining community where lead ore was mined, smelted and transported to the outside world, by rail. The phrase 'outside world' is applicable even to-day for Wanlockhead is isolated with little to offer its 350 odd inhabitants in the way of work or modern amenities. It was in 1934 that the last mine closed down. The preceding years were marked by a gradual decline in mining activity as the ore became uneconomic to work; by a decrease in the population as the young people left to seek work elsewhere. Over the twenty year period 1931-1951 the population fell from 556 to 356 and to-day the village is but a shadow of what it was. Yet the future is not without hope, because the mineralised veins are not exhausted and recently interest in them has revived.

To-day Wanlockhead wears the air of a village bypassed by the rest of the world. The typical miners' rows are unchanged, the smelting plant in the Wanlock Burn valley stands in ruin and the branch line of the railway from Crawford is closed. Added to these outward signs of neglect are remoteness—a factor which must have played a large part in the abandonment of the workings—and the fact that the natural environment has nothing else to offer. Steep, encircling slopes restrict agriculture to the keeping of a few sheep, some pigs and poultry, with the occasional garden growing vegetables. Although a lucky few actually work in the village itself, the majority have to go elsewhere.

In this respect the menfolk have been relatively fortunate. Many of them have turned their hand to coalmining in the Douglas or Sanquhar coalfields whilst others find employment of an unskilled nature in the construction of the Daer Reservoir, but in both cases special buses are required to convey the men to and from work. The Daer project moreover will soon be completed. A recently built radio communications and radar navigation station (Ministry of Civil Aviation) on Lowther Hill (2,377 feet) to the south-east of the village employs one or two trained men. For women, jobs are available in either Abington or Sanquhar but as these places are little more than villages themselves, the choice is limited. When everything is considered, therefore, it is not difficult to see why the population is falling so rapidly.

Set against all these things which seemed to point to the end of Wanlockhead is the recent decision taken by a mining company to restart operations in some of the old workings; for this purpose £37,500 is to be sunk in erecting a new mill and the mine itself, although small, will provide work for about 75 men. But the most important effect will be in the village.

R. S.

POWER FROM GEYSERS IN NEW ZEALAND

For some time the Italians have been deriving power from natural steam obtained by boring in volcanic districts. Since 1950 exploratory bores have been sunk in the WAIRAKEI GEYSER valley in hopes of being able to harness natural steam for the generation of electricity. Conditions proved much more difficult than in Italy. There, the steam-bearing strata lie below compact and cool rocks, presenting a relatively easy drilling problem, but in the New Zealand location, all the sub-surface rocks are hot and permeable to water and thus precautions have to be taken to cool the drill. Otherwise, temperatures high enough to bake the mud are developed and it may become impossible to withdraw the drill and the bore has to be abandoned. Difficulties, however, are being overcome and bores have been sunk to 1,500 ft, attaining temperatures as high as 200° C. with a flow of steam equivalent to some 4,000 kilowatts per hour. The latest bores, using improved techniques and equipment have attained 2,838 ft. and steam pressures up to 1,000 lb. per square inch have to be handled. Estimates of the power available from these bores are of the order of 10,000 kilowatts. It would appear that an important new source of power is in sight for New Zealand, with, no doubt, important repercussions on the economy of that country.

R. M.

REVIEWS OF BOOKS

EUROPE

The Oxford Region : A Scientific and Historical Survey. Edited by A. F. MARTIN and R. W. STEEL. 10 x 7½. Pp. xii + 202. 63 figs. 6 plates. London : Oxford University Press, 1954. 21s.

The Oxford Region takes in roughly the country between the Cotswolds, Chilterns and Berkshire Downs, over which the city exerts "a surprising degree of influence". The twenty individual contributions, ranging from 'Geology' to 'the University To-day' are inevitably watertight to some extent, but the emergence of some recurring and significant themes gives the volume a real coherence. Examples are the far-reaching control of the rocks on the history and geography of the region and its central position in Southern England. It has long been a kind of rural 'vacuum' in the midst of growing industrial giants, and this essential character has only been modified in the last few decades, when industry has "laid its hands", in Professor Gilbert's words, "upon one of the fairest cities of the world".

D. J. M. H.

The Settlements of the Celtic Saints in Wales. By E. G. BOWEN. 8½ x 5½. Pp. x + 175. Frontispiece. 53 figs. Cardiff : University of Wales Press, 1954. 10s. 6d.

Geographers know that Professor Bowen has achieved a very deep understanding of Wales and of Welsh problems, and they will welcome his new book. The first part of the book is devoted to the study of dedication-distribution patterns. The second part is a settlement study based on 614 carefully checked examples of ancient churches either now, or formerly known to be, dedicated to Celtic saints in Wales. It includes a study of the position of the churches, an analysis of their sites, and an assessment of the settlement patterns associated with them.

The treatment of distribution and settlement problems gives this work a much broader geographical interest and value than the title might suggest. For example, in the discussion on "The Settlement around Celtic Churches : a Study of Form," new approaches to settlement problems are indicated and some old concepts are critically reviewed. It is, however, difficult to select isolated examples from what is essentially a well-integrated argument, and the book, as a whole, will certainly be appreciated by all geographers.

S. J. J.

ASIA

From an Antique Land : Ancient and Modern in the Middle East. By JULIAN HUXLEY. 8½ x 6½. Pp. 310. 3 figs. 66 photographs. London : Max Parrish and Co. Ltd, 1954. 25s.

This volume consists of a number of impressions of the Middle East, ancient and modern, experienced by the author during his travels there in 1948 on behalf of UNESCO, deepened and enriched by later study. At times modern political events jostle most unhappily in the text with those of the ancient landscape he is in the main describing but the final result is not displeasing. In an area so closely associated with the birth of civilisation, the remains of "rose red cities half as old as time" figure prominently and give rise to some particularly good descriptive paragraphs and photographs, and useful summaries of their respective histories. Their rural background, on the other hand, does not receive the same enthusiastic and detailed treatment. Of particular interest, however, is Dr Huxley's restatement of the case for parallelism—if not identity—between biological and cultural evolution. His concept of 'evolutionary humanism' certainly merits attention from students of a subject that owes many of its ideas to early workers in the biological field.

W. K.

India and Pakistan: A General and Regional Geography. By O. H. K. SPATE. Chapter on *Ceylon*, by B. H. FARMER. 9x6. Pp. xxxvi+827. Frontispiece. 160 figs. London: Methuen and Co. Ltd. New York: E. P. Dutton and Co. Inc., 1954. 65s.

At last we have within a single volume a comprehensive survey of the Indian subcontinent, and containing much that has not been said before or said less pointedly. The most important part of this book is the regional description. The pattern of treatment is varied to suit the material and atmosphere, and detailed descriptions are supported by equally detailed maps. There is no basis for comment on the author's choice of regions, as for his purposes he manages to arrive at a division "in the actual process of writing the regional descriptions". At the end of this part is an excellent account of Ceylon contributed by B. H. Farmer.

The usual systematic treatment in the first half of the book is perhaps less happy. The author admits no great competence to deal with the physical aspects, but he is too harsh with himself: it is a great achievement to have brought together such a great wealth of material. He is at his best in the second part, on 'The People', where the pages glow with a warmth of understanding. In the third part, on 'The Economy', he sometimes interprets the problems of the subcontinent in terms of industry—a practice against his better and stated judgment.

This is a great work, worthy of a place in any library. In its very immensity it is a triumphal arch, rather than a milestone, along the road of geographical literature.

O. H.

Men Against the Jungle. By RITCHIE CALDER. 8½x5½. Pp. 231. 16 plates. end-paper map. London: George Allen and Unwin Ltd, 1954. 15s.

One of the most momentous and intricate problems facing mankind is the future destiny of the peoples of southern and south-eastern Asia. No single, simple solution can be given to a problem which involves the material and spiritual cultures of such contrasting societies and environments, nor is it safe to alter conditions in one field without recognising the repercussions throughout the whole. It avails little if western medicine by removing pestilences merely increases the numbers subject to the other Malthusian horrors of famine and war. Nothing less than a combined operation will suffice to remove the vicious circle of poverty, ignorance and disease characteristic of many of these under-developed regions, and it is such an operation, launched under the aegis of the United Nations and its Special Agencies, that Ritchie Calder describes in this well-written and well-illustrated book. Its most remarkable feature is the manner in which the author gives reality to the technical plans by showing their impact on every-day life and actual people, whether they live in Borneo jungle clearings or the slums of Calcutta.

W. K.

AMERICA

Nunamiut: Among Alaska's Inland Eskimos. By HELGE INGSTAD. Translated by F. H. LYON. 8½x5½. Pp. 256. 45 illustrations. Map. London: George Allen and Unwin Ltd, 1954. 21s.

One day in the summer of 1951 a plane from Fairbanks, piloted by the famous Alaskan airman Sig Wien, landed Helge Ingstad, a Norwegian explorer, in the heart of the Endicott Mountains. Here dwell the remnants of the Nunamiut, a nomadic tribe of inland Eskimo, whose well-being depends upon the caribou herds they follow to the arctic coast in summer, and southwards through the Brooks Range in autumn. Helge Ingstad spent a year with his new friends, who received him with the immediate hospitality of the Eskimo. The result is published in this fascinating and beautifully illustrated volume, which describes a people who have lived an exceptionally isolated life, even from other members of their race. There is a good map, and the book, first published in Norwegian, has been excellently translated.

I. W. H.

ECONOMIC GEOGRAPHY

Economic Geography. By CLARENCE FIELDEN JONES, PH.D., and GORDON GERALD DARKENWALD, PH.D. 9½×7. Pp. xxxv+612. 442 figs. End-paper maps. New York: The Macmillan Company. Revised edition, 1954. \$ 6.75.

This is a revised edition of the well-known text first published in 1941 [see *S.G.M.*, 58(1): 46]. Statistical material has been brought up to date, there are several changes in maps and diagrams, and a new chapter, by D. R. Peterson on 'The Chemical Industry', has been inserted. The book still tends to give disproportionate attention to North America, however.

There are four new end-paper maps. The one showing world population suffers from excessive congestion of symbols, and the 'world identification' map shows some confusion of labelling in the Baltic States and the Middle East, apart from presenting East European countries in their 1939 frontiers. A new map of pig-iron and steel production in the United Kingdom has three errors in the names of counties, irritation being increased by the fact that Essex is treated in the key as part of the East Midlands. Moreover, together with 'Northaunts', it lies outside the East Midlands area delimited on the map (p. 450). On a new map of British motor-vehicle centres (p. 490), such important centres as Dagenham and Leyland are not identified. The companion map of aircraft centres suggests the existence of off-shore manufacture as a result of the disappearance of the Isle of Wight.

R. H. O.

Chisholm's Handbook of Commercial Geography. Rewritten by L. DUDLEY STAMP, C.B.E., D.LIT., D.SC., and S. CARTER GILMOUR. 8½×5½. Pp. xiii+915. 30 diagrams and maps. London: Longmans, Green and Co. Ltd. Fourteenth edition, 1954. 60s.

Chisholm's Handbook first appeared in 1889. Since 1928, Professor Stamp has been responsible for its revision, and, with the assistance of Mr S. Carter Gilmour, he has now brought out the fourteenth edition. This takes account of the political and economic changes which have occurred since 1937, although, as in previous editions, the essential framework of the book has been left unchanged. Indeed, so much of the original text has been preserved—including Chisholm's quaint and hoary list of Britain's advantages and disadvantages for foreign commerce on pp. 326-7—that one is tempted to wonder how much longer new wine can successfully be poured into old bottles.

Thumb-nail sketches of the commercial geography of the various countries still remain an important feature of the book, although the adequacy of revision tends to vary from country to country. There are several new maps—illustrating, for instance, the St Lawrence Seaway and Middle East pipelines,—but the one of Currency Areas (p. 121) contains a number of inaccuracies. The retention of the map showing the hinterlands of German ports is probably of doubtful value (p. 107), and the new map of British iron-ore workings tends to give a misleading impression of the relative importance of the non-Jurassic ores (p. 329). On p. 451 Titograd (Podgorica) is confused with Cetinje, and several errors—unrelated to problems of transliteration—occur in the list of Russian cities on p. 517.

R. H. O.

ATLASES

Oxford Economic Atlas of the World. Prepared by THE ECONOMIST INTELLIGENCE UNIT and the CARTOGRAPHIC DEPARTMENT OF THE CLARENDON PRESS. 10½×7½. Pp. ciii+112 (atlas)+152 (index). London: The Oxford University Press, 1954. 30s.

The Economist Intelligence Unit and the Cartographic Department of the Clarendon Press have joined forces to produce what is not only an atlas but also a compendium of national economic statistics. Its publishers hope that it will appeal to economists and geographers, to people in the business world, and also to a wide general public. Much labour, both statistical and cartographical, must have gone into the production of this volume, which, on the whole, successfully presents the

broad distributional aspects of the economic life of the world in a compact and palatable form.

The first half of the book consists of world distribution maps for a large number of commodities grouped into ten sections. Maps showing "physical factors affecting crop production" and general reference maps for each continent precede this main series, while a short concluding section deals with population and communications. The second half of the book is a statistical appendix, to be used in conjunction with the atlas, which shows for each country recent figures of production of the chief commodities and details of international trade in them. Concise and informative background commentaries, as well as statistical diagrams, precede each group of maps; further comments and tables also appear on the margins of the maps themselves.

Nearly all the world maps (1:100,000,000) are drawn on the 'Oxford' projection, which is an equal-area projection conveniently dispensing with much of the Atlantic and Pacific Oceans. The usual cartographical problems arising from wide variations in the intensity of occurrence of the different commodities over the earth's surface are not always satisfactorily solved, however. Thus excessive congestion—though probably inevitable—spoils the appearance of many of the maps. Two rather unfortunate attempts at superimposition showing, respectively, temperature and rainfall and minerals and industries, occur on pp. 4-5 and p. 104.

It is to the labelling of the various symbols that criticism will perhaps most quickly be drawn. On some of the maps showing the output of industrial products (e.g., rayon) exhaustive lists of production-centres have been given. Frequently these are the names of little-known suburbs or small towns which are not to be found marked in the usual atlases.

For certain maps a distinction is made between 'major' and 'minor' producing districts, although it is not clear how this division is arrived at. The difference in size of symbols is such that the map of cotton-yarn production, for instance, suggests a far greater relative importance of the smaller centres than is probably justified. This effect is enhanced by the detailed naming of the smaller centres.

Typographical errors occur on pp. 21, 73, and 91. On p. 67, Tammerfors and Helsinki occurring side by side suggests a lack of consistency—Tampere appears on p. 65. Joachimstal and Teschen might well have been given their Czech names. The qualification 'thermal' would appear to have been omitted from the title of the diagram (p. 75) showing "Electrical energy generated in the United States".

It is intended to follow this volume with a series of regional economic atlases. These will amplify the information in the world atlas and, in view of the larger scale of maps possible, should present fewer difficulties to the economic cartographer.

R. H. O.

Sudetendeutscher Atlas. Edited by E. MEYEN. Collaborators: E. Bachmann, A. Hammerschmidt, K. Oberdorffler, H. Raschhofer, E. Schwarz, W. Weizsäcker. 16½ × 11. Pp. vi + 56 (text) + 28 (maps). 18 photographs. München: Verlag der Arbeitsgemeinschaft zur Wahrung Sudetendeutscher Interessen, 1954.

In his Preface, Professor Meynen states that this atlas "represents a scientific work for future conferences, making clear the geographic and historical facts of the Sudetenland". In the text—German, French, and English—it is avowed that the goal of the Sudeten Germans "in common with the other German expellees" is "the winning back of the homeland". Czech place-names are Germanised or re-Germanised, even where, according to the 1930 census, the German minority amounted to less than one per thousand Czech inhabitants. Apart from manifesting the perennial German eastward urge the atlas is interesting and valuable because of the amount of cultural, historical, demographic and economic information presented, and because of the good quality of the maps and excellent production. The coloured maps, a number of which are based on the Atlas of Czechoslovakia (1935), were prepared at the Bundesanstalt für Landeskunde in Remagen.

J. H. K.

ROYAL SCOTTISH GEOGRAPHICAL SOCIETY

PROCEEDINGS

MEETINGS OF COUNCIL were held on the 14th December 1954, 18th January and 1st March 1955

LECTURE SESSION 1954-1955

The following lectures were delivered :

EDINBURGH. *Usher Hall*.—F. SPENCER CHAPMAN, D.S.O., on "Lightest Africa", December 9th. HERMANN BUHL and Dr. WALTER FRAUENBERGER on "The Ascent of Nanga Parbat", January 13th, 1955. Commander C. J. W. SIMPSON, D.S.C., R.N., on "The British North Greenland Expedition, 1952-54", February 10th. "The Silent World" (Cousteau's Underwater Film), presented by LEN KENYON, March 10th. *Central Hall*.—Major GEORGE SHERRIFF, O.B.E., on "Wanderings in Tibet", December 1st. Dr N. R. A. MACKAY on "Two Peruvian Cities" (Cuzco of the Incas and Lima of the Spaniards), December 15th. Dr WM. R. FIETT on "Life in the Antarctic, 1944-46", January 19th, 1955. NOEL STEVENSON, O.B.E., on "The Hill Peoples of Burma", February 2nd. SYDNEY M. JONES on "A South Atlantic Cruise", February 16th. Dr N. MILLER on "Mountains European and American", March 2nd. Dr MACLAGAN GORRIE on "Life and Plants in Ceylon", March 16th. The lecture by IAN CHARLESON, on "Climbing in the Alps", was delivered on November 17th, not on November 11th as stated in Vol. 70, No. 3, p. 158. *Society's Rooms*.—(New Developments in Geography.) Professor M. L. ANDERSON, M.C., Department of Forestry, Edinburgh University and, Mr EDWARDS, M.A., Research Branch, Forestry Commission, on "What are the limits to possible afforestation in Scotland?", March 3rd.

GLASGOW. *Grand (St Andrew's) Hall*.—F. SPENCER CHAPMAN, D.S.O., on "Lightest Africa", December 10th. HERMANN BUHL and Dr WALTER FRAUENBERGER on "The Ascent of Nanga Parbat", January 12th, 1955. Commander C. J. W. SIMPSON, D.S.C., R.N., on "The British North Greenland Expedition, 1952-54", February 9th. "The Silent World" (Cousteau's Underwater Film) presented by LEN KENYON, March 11th.

DUNDEE. *Training College*.—F. SPENCER CHAPMAN, D.S.O., on "Lightest Africa", December 6th. HERMANN BUHL and Dr WALTER FRAUENBERGER on "The Ascent of Nanga Parbat", January 10th, 1955. Commander C. J. W. SIMPSON, D.S.C., R.N., on "The British North Greenland Expedition, 1952-54", February 7th. WILLIAM KIRK, B.A. (Lond.), Department of Geography, Aberdeen University, on "Verdal—a Norwegian Valley" (The Aberdeen University Expedition to Norway, 1953), March 7th.

ABERDEEN. *Y.M.C.A. Hall*.—SIR GEORGE WILLIAMSON, D.L., B.L., on "Some East African Ports", December 7th. HERMANN BUHL and Dr WALTER FRAUENBERGER on "The Ascent of Nanga Parbat", January 11th, 1955. Commander C. J. W. SIMPSON, D.S.C., R.N., on "The British North Greenland Expedition, 1952-54", February 8th. WILLIAM KIRK, B.A. (Lond.), Department of Geography, Aberdeen University, on "Verdal—a Norwegian Valley" (The Aberdeen University Expedition to Norway, 1953), March 8th.

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